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ABSTRACT

The use of graphics (maps, charts, diagrams, renderings, photographs) for regional policy formulation and decision making is discussed at length. The report identifies the capabilities of a number of tools for analysis/synthesis/communication, especially computer assisted graphics to assist in community self-education and the management of change. Part 1 outlines the features of the analysis/synthesis/communication tools needed to formulate better policy to conserve and develop regions. Part 2 reviews graphics related technological systems: NASA, EMISARI, NIPS, the Vancouver Regional Simulation Study, the Des Moines Integrated Municipal Information System, San Diego IREM system, the Columbus Benchmark project, New York's TV Town Meeting, TICCIT, PLATO, CHARGE, Theta Com, TOCOM, Scriptographics, EIDOPHOR, GE Light Valve, ARPA, and three computer animation projects. (WM)

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Graphics

for Regional Policy Making, a preliminary study

William R. Ewald Jr., *development consultant*

for the National Science Foundation, 1973

IR 000 698

GRAPHICS

for Regional Policy Making, a preliminary study

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Robert W. Lamson, Project Coordinator

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PART I

ABSTRACT

This report assumes that this is a time of extraordinary change, that this change is pervasive, and that to manage it will require us to develop new institutions and new processes - as well as to modify ongoing institutions. (The principal investigator's NSF report ACCESS - The Santa Barbara Pilot Process contains a description of such a new institution and process to improve regional policy-making.)

This report also assumes that new analysis/synthesis/communication capacities are needed for these institutions. The complexity and continuous interaction of the many factors involved in regional policy-making seems to call for data, comprehension and communication as never before. Even the definition of policy-makers seems to be changing, to include more than the traditionally recognized officials of government and business. It is now becoming evident that concerned citizens, especially the leadership of citizens' organizations, are also needed as policy formulators, who take part all through the process, from conception, definition of problems, the gathering of data, the analysis of alternatives, decision-making, through to implementation and evaluation.

For a democracy to perform in this technological era of great change it probably must reeducate itself to the task. A result of this line of reasoning is to recognize that education is analysis, synthesis and communication. To put it yet another way, if education is the process of teaching people how to think about things, then the analysis/synthesis/communication process described here is community self-education.

This report identifies and delves into the capabilities of a number of tools for analysis/synthesis and communication, especially computer assisted graphics. It invites consideration of the potential of this technology for the purpose of managing change, but the principal investigator does not expect that simply by employing such new tools that the inexact can be made exact, the unquantifiable quantified or decision-making automated. But I believe that these new electronic tools can contribute to developing a capability that we now lack for managing change.

Part I outlines the features of the analysis/synthesis/communication tools needed to formulate better policy to conserve and develop regions. Part II is a preliminary effort to match that need with technology that is already evolving.

I. GRAPHICS FOR REGIONAL POLICY MAKING

GRAPHICS

This report emphasizes the use of graphics (maps, charts, diagrams, renderings and photographs) for regional policy formulation and decision-making. Does this mean that the alphabet and numerals, graphic symbols in themselves, are to be left out? Actually, words and numbers are not only essential auxiliaries to the successful use of non-verbal symbols, they may commonly provide complete communication within analysis/synthesis/communication systems which offer non-verbal graphic capabilities. The important matter here is whether or not the system provides non-verbal graphic capacity.

Why this emphasis on non-verbal graphic technology? This report assumes that non-verbal graphics can greatly aid analysis, synthesis and communication concerning the many variables involved in formulating regional policy. Although such graphics have been used in planning and policy-making in the past, this report assumes that a whole new language of visual communication is on its way which holds great potential for regional policy-making.

We are moving into an era when color, pattern, motion, sound, and two-way communication will be increasingly available. For policy-making, research, education and management this means a new possibility for comprehension of complexity, without the distortions of over-simplification.

Graphic communication offers a potential for clarifying perception. It offers a way to improve our intuitive intellectual grasp of large complex systems. It provides a new opportunity to perceive the values and attitudes behind conflicting viewpoints. Graphic communication can convey complexity much more quickly, provide spatial orientation for information, and cut through semantic difficulties that confuse different specialities and different political and cultural views. The graphic communications of television are what most people "read," and it offers the potential of being able to communicate the abstractions of future consequences of pending decisions in more understandable form, within limited spans of attention. Further, graphic communication with two-way capability can be queried to suit and enhance the understanding of the user. This is an absolute essential for comprehension of regional problems, unsticking mental blocks that cannot often enough be perceived by other persons.

Regional decision-making, under pressure, that attempts to take into account the complexity of interrelationships among many variables, over different geographic scales and at varying increments of time, while accounting for changing technology, and at the same time acknowledging the changing expectations of people, needs more than reports, rolls of maps or public hearings to illuminate problems, choices and consequences! It seems to call for graphics of all kinds, including computer assisted graphics that are responsive to the viewer.

THE REGIONAL POLICY MAKER

The term, regional policy maker, as used here includes those who contribute to the formulation of policy as well as those who decide policy. Both are considered part of "policy-making." Therefore, interested citizens, as individuals and as organization members, are policy-makers -- as are corporation directors and government officials, elected or not. That is a substantial difference from the more common use of the term and contributes significantly to the definition of the analysis/synthesis/communication process required.

A listing of assumptions about the regional policy maker may be helpful here; he is:

(1) an intelligent, basically honest generalist;
(2) under political and time pressures to make decisions;
(3) inadequately informed and full of his own questions;
(4) impatient with details, but skeptical of summaries;
(5) able to give only severely restricted time for analysis;
(6) suspicious of computers (and their programmers);
(7) uncertain about typing into a computer terminal;
(8) unable to comprehend, unaided, the interrelationships of many variables;
(9) probably limited in his ability to use maps, charts or graphs;
(10) skeptical about the validity of long-range projections (and expert opinions);
(11) limited in his comprehension of development factors, important to the region, which work at different geographic scales;
(12) only partially informed regarding technology and its impact;
(13) not really convinced that major social and economic changes are underway;
(14) a believer in adaptation, not radical change;
(15) seeking respected authority on which to base his decision.

MAKING REGIONAL POLICY

To make regional policy seems to involve different groupings and combinations of people:

(a) an aggregation of public officials without an established regional political constituency;

(b) businessmen with differing short-term concerns, some controlled from outside the region;

(c) citizen-based groups which may or may not be regional in scope, each with different purposes in mind; and

(d) many other competent people, including those in universities and in the professions, who don't yet relate to "region" as important to what they do and how they live.

To communicate concepts, issues, information, analyses, judgments, and feelings about regional issues to these regional policy-makers in such a way that basic choices buried in current decisions are related to alternative futures, seems to call not only for valid analysis and communication, it must also be accepted as credible. Whereas a major aspect of credibility of information is its source, perhaps much more significant than the scant attention it has been given to date, is how regional policy-makers perceive information. This is a matter, not only of how their minds are already "set" when they receive information, but how information is presented to them. The physiology and psychology of how we see and receive information may have an importance to policy-making that is yet untended.

Probably, information, even if it is accurate, valid and reliable, must be assimilated comfortably by a person, to the point it "feels right", before it is credible. When information reaches that state, that of an insight to be trusted, it can affect policy-making. It may be that information must become something akin to "intuition" before it leads to decision. If intuition, in turn, can be defined as unconscious reasoning, then whatever helps that reasoning has a significant effect on credibility.

The important point for the policy-maker besides the accuracy, validity and reliability of the information, analysis and synthesis provided him, is whether it is readily assimilated by him. To assimilate and use information, he probably needs to "sense" as well as to rationally calculate his decisions. In that he can assume that the information and data provided him will amost always be inconclusive, however conscientious the effort, it is especially important to recognize that information has to "feel right" before he can decide with it. One needs to feel

somewhat more comfortable with one view than with others in order to make a decision at all (except the decision not to decide.)

Ultimately, the policy-maker must leap from the best that can be quantified and reasoned, across what cannot be known, to his position or decision. It's a leap of faith, or what policy analyst Sir Geoffrey Vickers terms "the passion of judgment." (Beyond reason alone.)

There are many subjective elements in arriving at a decision or a position. The purpose for bringing more of the capacities of science and technology to regional decision-making is to help synthesize complex problems, to reduce uncertainty, to quantify those elements which are quantifiable, to reduce the number of subjective elements that are so because of ignorance, and to convey analysis and information with credibility, and to provide the forum, the feedback to assure valid means.

Recognizing that all alternatives for each issue cannot be explicitly stated and then precisely quantified, there comes recognition of the need for an accurate, credible process that generates and reinforces sound intuitions in the policy-maker. Much of the process we are seeking to evolve may be in the policy-maker(s) mind(s). Perhaps we should recognize that what we are attempting in computer-assisted interactive graphics is new abilities for feeding information to those minds. An example of that "processing" may be how we sensed Spaceship Earth from the Moon photographs taken by the astronauts. With that accurate graphic communication an entire perspective was perceived. (How puny the words of astronauts compared to their photographs.)

Non-verbal graphic symbols communicate to many levels simultaneously. Such graphic communications may become a "universal" language for policy-makers, managers, workers, learners and consumers about their region. The same information, used differently by researchers, policy-makers and the general public, may be communicated in the same form, through the same technology, using the same systems.

If people do not understand because they fail to perceive the "whole" of complex systems, because they lack a "perspective of reality," perhaps, by using common graphic symbols, people of a region can perceive more perspectives in common, including the understanding that different people, with the same information, may arrive at different perceptions. Maybe the perception of wholes will be among the greatest contributions graphic non-verbal communication can make to constructive regional dialogue.

II ANALYSIS/SYNTHESIS/COMMUNICATION TOOLS - DESIRED FEATURES

ACCESS

The companion report ACCESS - The Santa Barbara Regional Pilot Process, proposes a new institution and process to aid and improve regional policy-making concerning the conservation and development of the environment. That report defines the basic characteristics of the analysis/synthesis/communication technology that might be used by such an institution and process. Although use of such technology need not be limited to the ACCESS process, it will be helpful to summarize here the nature of ACCESS (Alternative Comprehensive Community Environmental Study System) which is the context for analysis/synthesis/communication tools proposed here.

ACCESS is:

(a) regional in scope (multi-jurisdictional);

(b) of, by, and for regional policy-makers (and open to use by interested citizens and students);

(c) a permanent, legally organized non-profit institution (with a broad base of financial support and a board that is representative of the region);

(d) a place and a means to store, retrieve, analyze, synthesize, and display regional data and information - economic, environmental, cultural - by means of an interdisciplinary staff, consultants, volunteers and community dialogue (that makes appropriate use of computers and available communication technology);

(e) without operating responsibilities, (the emphasis of ACCESS is on assessment of problems, alternatives and long-range consequences, especially as derived from pending decisions).

The institution and process are cross linked - indivisible. How then could the volume of data and information required be stored, called up, displayed? What sort of analysis/synthesis/communication tools would facilitate comprehension of the link between current regional decisions and future consequences? How could graphic display of information be used to stimulate regional dialogue on Growth and the Quality of Life? Just what sort of technology and what systems would improve regional policy formulation and decision-making of the sort described here?

STORING AND RETRIEVING DATA AND INFORMATION

Traditional library storage techniques, ordered to the special purpose of regional policy formulation, are essential as the beginning. All environmental, economic and cultural data and information - especially in map and plan form - and all operational planning and legal reports for the entire region should be assembled in one place. Probably the library should be both in hard copy and micro-fiche form.

Data related to specific operating functions within the region (such as property descriptions, plats, assessments, zoning, public works, commerce and industry, traffic, utilities, housing, water, sewer) might best be maintained by the organization that has responsibility for and greatest use of that data, provided the data is coded, indexed and put into compatible computer format so that it can be easily accessed from remote terminals, and can be spatially displayed in relation to other data and information.

A study would need to be made of existing sources of data, how it is currently assembled, what scale grid and/or property reference? What systems it could be keyed to? What additional data and information are needed? How it is to be collected and maintained? (Information is defined here as ordered or interpreted data.) What bank of select regional, state, national and world indicators of particular value to regional policy-making would be ordered into a format to be retrieved through computer assisted terminals?

COMPUTER TERMINALS

Present terminals, and the programs they use, have been developed largely of, by, and for middle management for operational purposes. If they are to be used effectively for policy-making, adaptations of certain equipment and programs seems needed. Computer terminals should offer policy-makers:

(a) response to unstructured questions;
(b) visual display that is capable of continuous tone color and movement;
(c) larger-size (than typical now) alphabet letters in both upper and lower case;
(d) graphic as well as alpha-numeric inputs;
(e) hard copy of any display;
(f) audio as well as visual responses;
(g) audio as well as graphic and keyboard inputs;
(h) interchange with other terminals in all modes (audio, graphic, keyboard, etc.);
(i) access to data for personal use at place of work, in designated public places (such as schools, or libraries or community centers) and at home;
(j) access to data for dialogue purposes in specially designed "regional situation rooms".

Some of these capabilities are available now, but not all of them. They would be needed in varying degrees of completeness at various locations. The most completely equipped would be the regional situation room.

REGIONAL SITUATION ROOMS

Each region would need one basic center for the library, core staff and the central regional situation room.

The central regional situation room would provide a specially designed dialogue facility for approximately 15-20 people which would have all needed graphic and analysis support facilities, including television equipment for video-taping and for conveying two-way signals to other situation rooms within (or outside) the region.

As NASA has found, the overhead projected slide delivered ahead of time, serves well as the focus for simultaneous conferences at separate locations interconnected by special high fidelity telephone lines. (See page 16) The program EMISARI, which provides hard copy printout from a keyboard terminal, has increased the efficiency of conferences partially <u>because</u> people using it are conferring from separate locations. (See page 21)

Motion pictures, videocassette and slide projector facilities would be part of the equipment of each situation room where group discussions are held. Except for very large "surround" screen projection or when highest resolution images are required, projected or standard monitor size television offer the potential of coupling to digital computers, and interactive response and control, which supersedes other means of providing graphic display for regional policy-making purposes.

The situation room might very well provide for each participating member the following: a television monitor with keyboard; a Scriptographic or RAND Tablet for graphic inputs. (See page 48) There are other pushbutton controls to register opinion and degree of concern, electronically. The CONSENSOR is a commercial product available for this purpose. Another potential product varies the size of images on multiple projection screens; images are increased or decreased in size according to opinions registered by pressing buttons. (For more on CONSENSOR, see page 65)

Large-scale (10' to 20' in width) projection of television and digital symbols by means of devices such as the Eidophor or GE Light Valve (See page 50) would seem to be desirable for focusing attention on one speaker and one graphic presentation simultaneously, especially if the dialogue in the situation room is itself to be televised.

The computer backup capacity for the situation room could be by telephone line to commercial university time/shared facilities or to the ARPA Network (see page 51). Simple means to make inquiries should be made possible for any user, but for calling up certain information it is probable that at first a number of different programs and computers will be needed. Dealing with different computers and their different programs, at their present stage of development, is like dealing with Swedes, Chinese, Italians, Frenchmen, Englishmen and Argentines all at once. They may, or may not, all "understand" the same basic language; but they are not necessarily individually compatible (interchangeable).

This means having persons present to whom specialized questions could be put. They would operate the computer terminals very much the same as the terminals are manned at the NASA Command-Control Centers, each to its own special areas of operation. In a regional situation room accurate, quality-controlled information might be divided into three or more knowledge areas such as environmental, economic, cultural - each with its "specialist." If questions requiring especially powerful computation capacities were asked, the specialists concerned could turn to a special terminal, if need be, such as PLATO now provides. PLATO permits open-ended querying and dynamic responsive computation with graphic display, but it is not compatible with television. (See page 39)

AUXILIARY FACILITIES

Examples of electronic equipment to be investigated that have contributions to make to the analysis and handling of information include a 1000-line cathode ray tube (CRT) for fast, inexpensive computer-assisted animation, plotters to scan and make up maps, digital storage and manipulation capacity to move instantly from one scale enlargement to another.

III CONCERNS AND CONSTRAINTS

The previous section is only the most tentative sort of definition of the graphic analysis/synthesis/communication tools that seem to offer a useful potential to the proposed regional process worth further investigation. Even so, tentative as this report is it may, somehow, raise concerns or be interpreted to provide an emphasis other than what the principal investigator intends. Therefore, it seems sensible to state here that present expectations for using computers and two-way television should not be confused with their future capabilities. Attempts have been made at this elsewhere in this report by adding "as appropriate" when referring to present applications of computer and two-way television.

What is intended, in part, is to build on the experience of already developed computerized information systems. This is taken to mean, especially for regional policy-makers as defined here, avoiding as "the" answer one big comprehensive regional model, even with a number of submodels in it, (See page 24), except to simulate regional action in order to provide:

(a) perceptions of other peoples' perspectives of the region, through computer assisted role-playing games, and

(b) means to ask better questions and learn more about possible consequences of specific decisions.

The concept that there is one big computer program to be developed that can automatically arrive at the best decision, given any particular conservation or development problem, is not the use being thought of here. Rather, what is proposed is to use a variety of computer programs to store, retrieve, compute, and display information - or to provide other specialized capabilities such as generating computer assisted graphic presentations, including "walks" through proposed projects.

Programming for spatial displays responsive to unstructured query of information bases seems quite important to attempt. For instance, specific information that is instantly converted into graphic form and projected might go a long way toward focusing and deepening dialogue. But all this needs to be accomplished in such a way that the margin of error and degree of uncertainty of the information displayed, commonly a combination of different factors, is also clearly conveyed, preferably simultaneously. It is also true that the elements of computer programs need to be revealed for criticism including values implicitly incorporated into them. Without safeguards like these, the power of graphic presentation may be distorted from its intended use as an analysis/synthesis/communication tool to a sales or propaganda device. It is, therefore, no exaggeration to claim that a whole convention of symbols, color, motion and sound will need to be devised. It may also be clear from this brief description how critical will be the integrity of the institution that manages these facilities, for their proper use and credibility.

The facility described above would have major use by the non-profit regional institution interdisciplinary staff, but there is every reason it should be considered available for use by all policy-makers and their staffs, schools, businesses, civic organizations, etc.

The assumption is that different perceptions derived from display of the same basic regional data, information and analysis - in the situation room designed especially for this purpose (and perhaps televised) -

will help make many more people aware of the "different" realities of the region. In turn, it is hoped this will help move them from advocacy of fixed positions, to dialogue about possibilities. By reducing ignorance, uncertainty and sense of risk, people with naturally conflicting interests may more readily discover what they share, and work towards consensus without domination by any one group or individual.

Use of appropriate technology is proposed primarily to facilitate analysis, synthesis and communication on issues of moment to the region. The institution, process and technology conceived are not believed to be a substitute for political decision-making. Such decisions and business decisions would be made where they are now. The intended effect would be to alter the agenda of policy-makers, to better illuminate their choices and to involve many more people in the total decision-making process. The policy-maker would have a much better informed constituency and vice-versa. Even without the power of decision, a competent, credible, non-profit regional institution with continuity and its own base of communication would provide the region with a significant new means with which to derive decisions.

There is no way as yet to estimate the total cost of the analysis/synthesis/communication system for regional policy-making under discussion here. The next approach is to analyze for a specific regional situation just what technological systems are available and feasible now, what may become available, how extensively they might be used, what the total benefits to policy-making are, what they may help to provide (this might well include assessment of waste, construction and social damage they might prevent), and with whom the use and cost of facilities might be shared (such as television productions, government, research, businesses, schools and universities, civic groups, etc.).

PART II

I EVOLVING CAPABILITIES

This investigator has attempted to analyze the state-of-the-art of computer assisted analysis, synthesis and communication that has future practical application for regional policy-makers, including organized interested citizen-leaders. It appears today that there is indeed helpful electronic capacity now available for this purpose. The direction, at whatever pace it proceeds, is towards computer assisted interactive graphics and two-way television. The former is available now in the form of one color, line, cathode ray tube (CRT) display terminals and the electronic plasma panel of IIATO. Continuous color tone television image terminals are the promise of HumRRO, still under development.

To date, two-way television has been oversold and under-delivered, but that does not negate its potential. This year, for the first time, a number of full-scale community demonstrations will be underway. Three such systems are referred to here. They are concerned with testing consumer interest in using terminals (of various sorts) in the home for purposes such as information, instruction, purchasing and entertainment. For purposes of regional policy-making the technology is available, but it is not believed practical to begin with use of two-way television from regional situation rooms into each home of a community without first testing regional information content and the way it is perceived. An appropriate beginning of the application of this technology to regional policy-making would appear to be by multiple situation rooms of different degrees of complexity within a region, for either separate use or simultaneous interaction.

What follows here is a brief description of each of the technologies or systems investigated in the course of their investigation.

NASA's command-control centers, and its much simpler but vital conference room installations, come the closest to providing a regional situation room prototype. In its need for managing complex "real time" operations, NASA had assembled and developed techniques which suggest how "real time" access to complex data and information bases can be developed. Policy-makers, who never have enough time or total comprehension of their subject matter, need whatever facility that can be provided to reduce the pressure which often forces them to resort to over-simplification in order to reach any decision at all. The cumulative negative effect of decisions so made is evident in the environment all around us. But there is a limit to the time decision-makers can devote to each issue. And there is a limit to the policy formulation and staff analysis that is possible. Still, the necessity for decision persists.

During the year regional policy-makers will be concerned with reports, budgets and projects that may total 350 items, about which all possible

information must be at hand including location and timing. Any of these matters may be dropped or picked up several times during the year. There are controlling qualitative aspects of change in the environment to be analyzed and decided upon, such as pollution, housing, parking, street maintenance, waste disposal, congestion, zone changes, accidents, crime, code violations, income levels. Future potentials of the region and its neighborhoods need decisions and correlations with the comprehensive plan, which itself requires continued updating. Formulation of fiscal strategies and decisions concerning bonds, loans and the flow of cash are under continual review. Statistical data concerning schools, hospitals, welfare, transportation, etc., are frequently called for. There are also the operational problems of the various governmental departments.

Perhaps if the analysis/communication institution proposed can develop a process that uses some of the technology discussed here, important help can be provided to meet current regional problems and avoid future crises. Assessing this technology and these systems to learn their contribution to the managing of change in the environment as appropriate is the purpose here. Learning what the appropriate use is will come about only if the situation of the region is well understood and a community dialogue is begun on the Growth and Quality of Life desired there.

REPORT COMPREHENSIVENESS DISCLAIMED

It is important both to the integrity of the 25 graphic-related efforts described here, and to the integrity of this report itself, to disclaim comprehensiveness. This is a preliminary survey, the matter of 25 contracted man/days of work. As such, it does not claim to have identified all capabilities, to have examined those included here in depth, nor even is it claimed they are reported on with great precision, despite the care that has been given.

The 25 different efforts are grouped for convenience, a little arbitrarily. They are described in varying degrees of detail, which in itself is not intended to indicate how they are valued. The objective is to identify certain analysis/synthesis/communication tools and their potential for regional decision-making. Hardware-software systems that for complete understanding require complete reports in themselves are "covered" in a few paragraphs, and then "compared"! (By contrast, NSF is undertaking an extensive 2-3 year review and comparison of the TICCIT and PLATO systems alone.

The utility of this part of the report is that it locates resources, and provides general descriptions, which indicate what new graphic analysis/synthesis/communication capability to improve regional policy-making is

available and evolving. This report was undertaken from the perspective of the regional policy-maker, not the technician. It is written for policy-makers to help orient them to new tools for their work. The risk in such an attempt is the opportunity for misinterpretation. From the detail in which each particular effort reported on here is known at its source, this may have varying degrees of importance. Indulgence in the form of written critique is invited to correct inadvertent inaccuracies or oversights. Consider this copy as one for colleague review, not possible before within the scope of the work as undertaken.

To provide access to all resources referred to, addresses and phone numbers have been given.

II THREE CONFERENCING AND COMMAND-CONTROL SYSTEMS

NASA

National Aeronautics and Space Administration
Washington, D. C. 20546
(Egon E. Kafka, Chief, Skylab Program Planning and Control)
(202-755-3144)
(John Arslanian, TV and Visual Display Manager, Operations Center Branch)
(202-982-6137)

Certain management, monitoring and mission-control operations of NASA provide ready access to volumes of data and information for assembled working groups of people. NASA's means of handling operations for that was examined for what it might have to teach concerning "real time" access to volumes of information for regional policy-making. Two Management Information Centers in NASA's Washington headquarters were visited: SKYLAB and SPACE SHUTTLE, and, in addition, the Goddard Space Flight Center, Combined Mission and Network Operations Center, in Maryland. (DOD "war rooms" provide graphic and computer assisted display, but these are classified security operations. It is assumed that the NASA facilities at Goddard and Houston resemble certain aspects of DOD installations and have available to them much of the same technological knowledge.)

The simpler of the two types of NASA facilities are the Management Information Centers. Perhaps their singular characteristics are reliance on overhead projector graphics, and high fidelity 4-wire dedicated telephone lines interconnecting centers in different locations of the country. Fidelity is said to contribute significantly to voice recognition and ease of exchange between individuals assembled in groups in two or more centers. Before the conference call coded overhead projector slides are delivered to each center which is equipped with two overhead projectors, slide projectors and movie projectors. In addition, back lighted 4' x 6' translucent plexiglass management charts on sliding tracks line one wall.

The Space Shuttle Management Information Center is 20' by 25', carpeted, with a 12' table seating 23 people; the maximum recommended room capacity is 35. Besides the equipment referred to above, there is a standard speaker phone for back-up, and a Magnifax transmitter/recorder is available for facsimile transmission. (The new model can transmit or receive at the rate of one 8 1/2 x 11" sheet of copy in 3-4 minutes.)

NASA has established simple conventions for color, legibility, height-to-width ratio, symbols, and coding of its graphics. It has standard routines for calling conferences and running them, backed by the kind of staff and equipment it takes.

The Operations Control Center at Goddard, on the other hand, is a spectacular. (Even more so is the Manned Space Flight Center at Houston.) The

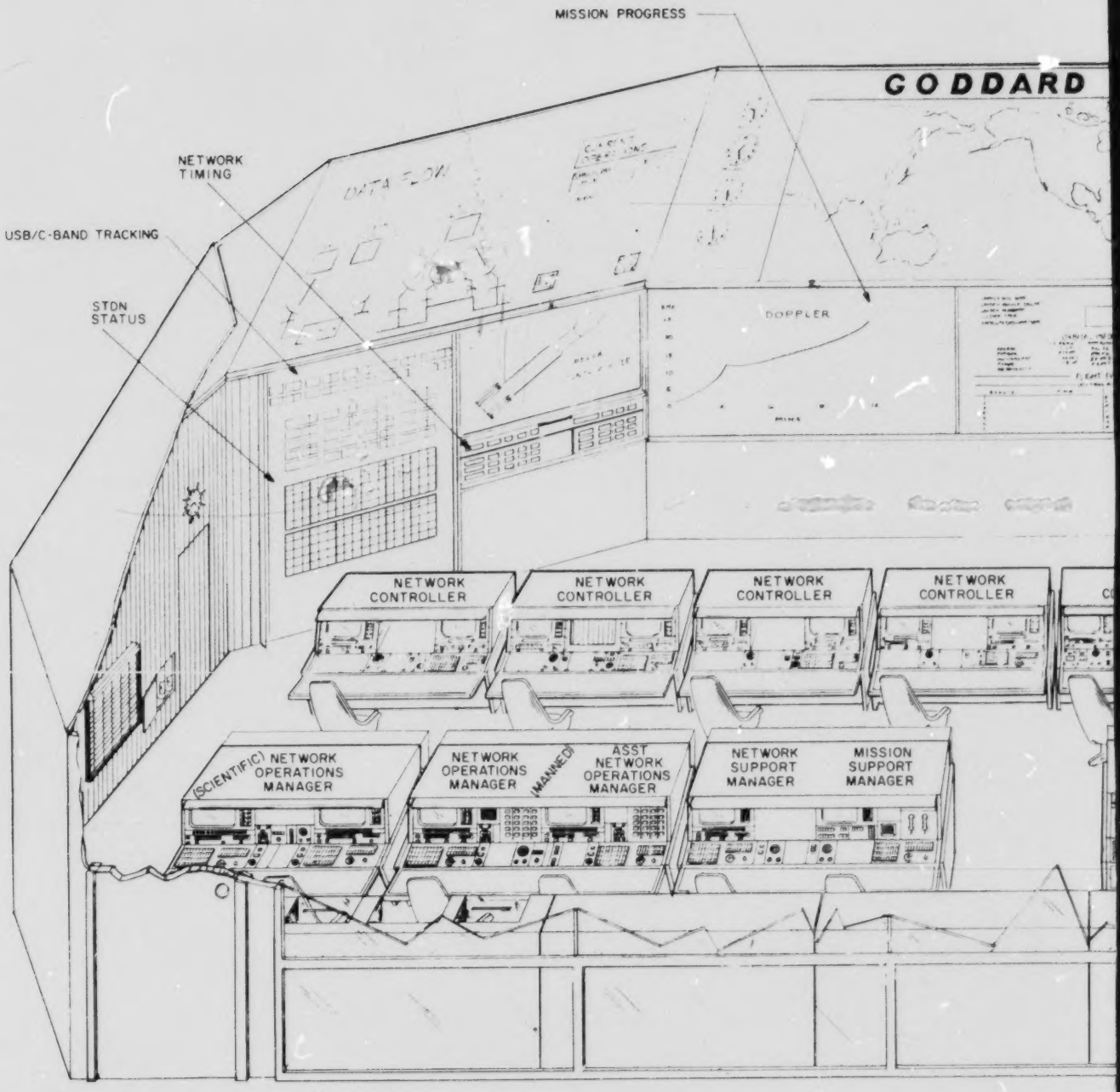
fold-out drawing attached shows the Goddard Center. It is a dimly lit three-storey room with 30 computer assisted monitors and large graphic wall displays, some rear projected displaying digitized information, and with the capability for slides, movies and live television. The need for this display on one wall is to provide a flow of information that is available at one time for all the controllers, managers and directors assembled in the room, monitoring all NASA non-manned space flights simultaneously. The individual display terminals, each separately manned, provide access to specialized areas of information as called for. Looking down into this room from glass-walled roofs from the same perspective as the drawing, are NASA project directors and upper management people.

Behind the long display wall is an area for rear projection equipment that seems as large as a theater stage. The basement level is lined wall-to-wall with computer equipment for the display terminals upstairs. The host computer is IBM's largest, the 360/95. The back-up computers are an IBM 360/75 and an IBM 360/65.

Characteristics of Significance - Great technological capacities were developed to support the space program - certainly one of the great success stories in the history of man. But what can this space technology contribute to man's life ON EARTH? Surveillance of the earth by satellite - generating information of ever increasing detail, accuracy and importance - is one example that can be easily understood. NASA has programs to facilitate such technology transfer. Perhaps some aspects of the management of NASA have of themselves a contribution to make. That is what this survey looked into. There do seem to be important similarities between NASA's managing of data and information and the management concerned with regional policy-making.

Dissimilarities too are important to recognize. Great as NASA's space program's successes were (and are), NASA's mission is by order of magnitude(s?) simpler than managing the conservation and development of regions. NASA is a one agency program. NASA programs deal with a fixed number of quantifiable variables. NASA's conflict or trespass over territorial rights is essentially trivial (although tracking stations worldwide are vital). NASA's mission is distinct from, and clearly not competitive with, other on-going operations. NASA's mission was launched with top national priority to "beat the Russians". NASA was well funded under programs that were necessarily committed to a long term before achieving ultimate results (8 to 10 years).

By contrast, regional policy-making is without a constituency. There is a collection of competing public and private entities, not one regional policy-making authority. Regional policy-making must deal with a vast number of variables; some unknown, some unknowable, some inadequately quantified, some not quantified at all. One way or another, almost all regional policy-making has some bearing on the geography of political jurisdictions and


MISSION PROGRESS
GODDARD
NETWORK TIMING
USB/C-BAND TRACKING
STDN STATUS
DOPPLER
NETWORK CONTROLLER
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NETWORK CONTROLLER
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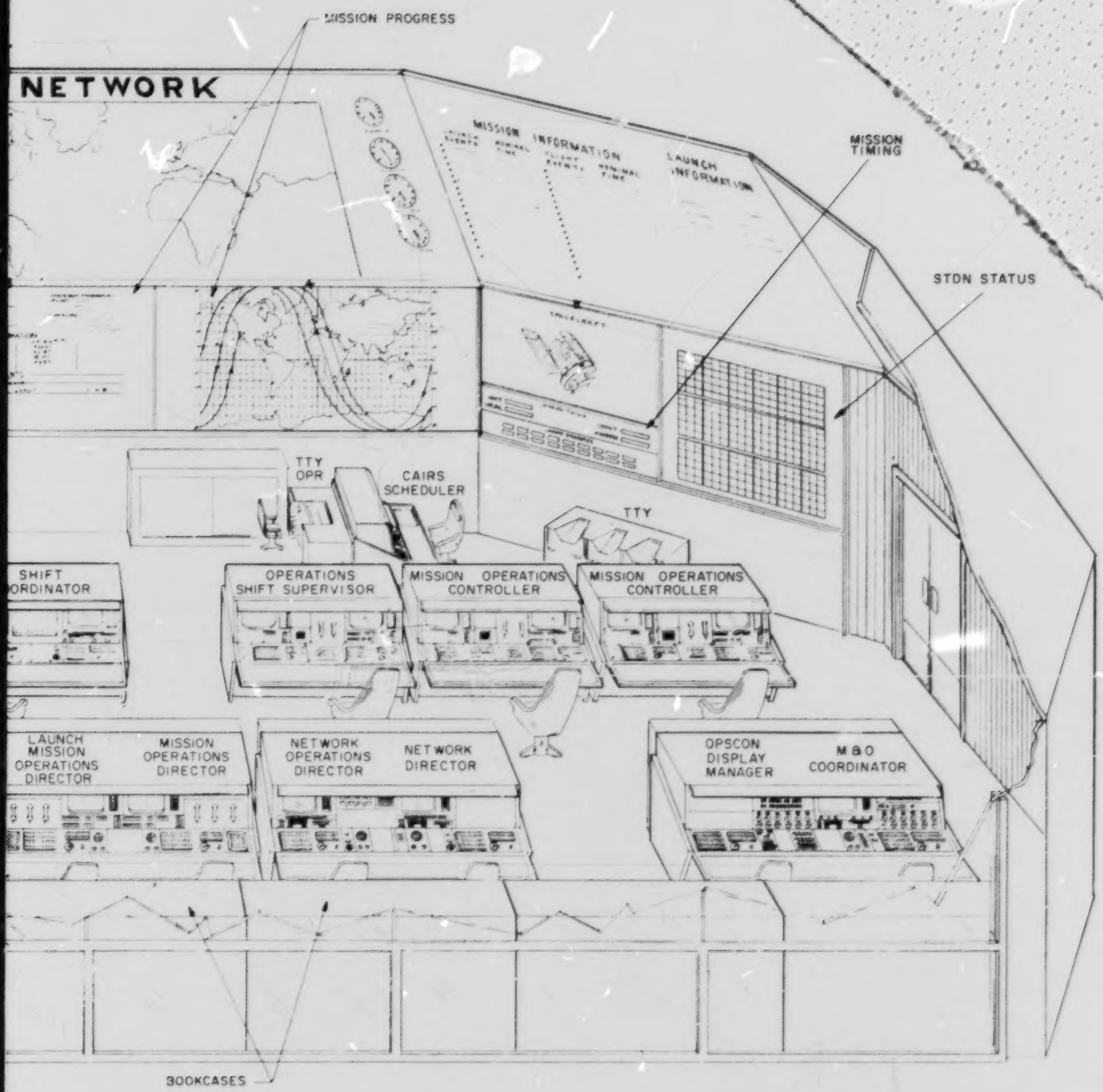
MISSION PROGRESS
NETWORK
MISSION INFORMATION
LAUNCH INFORMATION
MISSION TIMING
STDN STATUS
TTY OPR
CAIRS SCHEDULER
TTY
SHIFT ORDINATOR
OPERATIONS SHIFT SUPERVISOR
MISSION OPERATIONS CONTROLLER
MISSION OPERATIONS CONTROLLER
LAUNCH MISSION OPERATIONS DIRECTOR
MISSION OPERATIONS DIRECTOR
NETWORK OPERATIONS DIRECTOR
NETWORK DIRECTOR
OPSCON DISPLAY MANAGER
M&O COORDINATOR
BOOKCASES

property rights. Regional policy-making is related to on-going policy as it is already being made in the region; the business of making policy for an entire region is clearly not distinct from nor free of confusion with existing institutions. Going through the above, it is easy to see why there is no national, state or local consensus on regional priorities for policy-making. Regional policy-making is not well funded. There is no long-term commitment to it.

Making policy for regions is not exactly like making decisions in NASA, but at least there is a similarity to be found in the need to know - a lot - accurately and quickly. NASA must have at its disposal the capacity to store and retrieve, analyze and synthesize, vast quantities of data and information in order to manage its space mission. That has to be "real time" information for monitoring and management purposes in the Operations Control Centers. Availability and accuracy are essential. The information has to be credible and it has to be comprehensible. With it all, NASA has recognized and utilized ways to display information that is vital to the work in both its Management Information Centers and its Operations Control Center.

Regional policy-making, too, requires access to vast quantities of data, information, analysis and synthesis which is credible - and comprehensible. This is not needed by policy-makers in "real time" for the purpose of actually managing regional programs. The "real time" nature of the information needed is due to the constraints on the time of the policy-maker, and those with whom he interacts in policy formulation and making decisions. The complex nature of a region and its many variables and their interrelationships would be better understood, it would seem, if they could be analyzed, synthesized, displayed and understood in unanticipated combinations, quickly. The regional situation room itself being considered here, therefore, is "operational" - "real time".

The technology developed for the Department of Defense and NASA policy formulation and decision-making would seem to offer tools to help manage change in regions that has not yet been thought through and tested - especially with concern for graphics - and with implicit recognition of the actual quality of data and complexity involved.

EMISARI

The Office of Emergency Preparedness
Executive Office Building
Washington, D. C. 20504
(Murray Turoff - 202-395-5143)

The Office of Emergency Preparedness (OEP) has evolved EMISARI, an interactive program for conferring with its U. S. regional offices, and Washington headquarters, via terminal keyboards that print hard copy at the rate of 30 characters per second. The value of this method of calling conferences has proven itself since Phase I of the Administration's price control program. A chart of EMISARI's efficiency claims that 10-20 people at separate terminals - even if in the same building, much less the difficulty and expense of convening them from across the country - are more efficient than all 10-20 assembled for a typical conference in one room.

Computer based group communication permits simultaneous "talking" (typing) and "listening" (reading) as conferees choose. All remarks, additions, corrections, etc. are stored by the computer and made available in hard copy form as needed.

OEP uses a UNIVAC 1108 and has evolved its EMISARI program needs over time with its users in the form of a management system into which entries can be made at any time. Anyone using a connected terminal can update himself on information separately stored in "areas" informally labeled bulletin board, notices, policy, activities, news (clippings), public information, special people file, tables, explanation, estimates, messages, letters. Keyword searches for this information can be made using computer language BASIC.

Characteristics of Significance - The UNIVAC 1108 can handle up to 40 such terminals via normal telephone lines with EMISARI. The user's instruction "manual" consists of two diagrammatic pages of computer commands. It is quickly mastered and policy-level persons find themselves typing at terminals.

A basic point made by Murray Turoff, who explained this management system to me, seems especially pertinent to this investigation: the system evolved under the direction of the users themselves. It wasn't a matter of a year's delay while a consultant went off and developed the special hardware/software combination needed. That was seen as too theoretical, not only because taking a year off before employing this new capacity for Phase I was not possible, but because both the special needs and "comfortableness" of each user needed to be established before there was a system that would work and be used.

NIPS - National Military Command System Information Processing System

IBM
1601 North Kent Street
Arlington, Virginia 22209
(John R. Gerr, Manager, NIPS projects - 703-524-7068)

Federal Systems Division
18100 Frederick Pike
Gaithersburg, Maryland 20760
(Fred H. Badger, Marketing Representative - 301-840-7520)

NIPS is a formatted filing system program developed in 1958 for the Defense Communications Agency and only recently declassified. It is an advanced data management system that works with IBM System /360 computers and is compatible with the IBM 1410 Formatted File System that preceded it. NIPS (or NIPS 360/FFS) provides the ability to structure files, generate and maintain files, retrieve information, and output that information in simple or complex arrays. Our interest here is in the capability for structuring files by geographic coordinates and graphic spatial display of that information after what IBM refers to as "exhaustive diagnostics."

Quoting from the National Military Command System Support Center's Computer System Manual, CSM GD 15A-68, 1 July 1971 (NIPS 360/FFS) Section B, General Description, page 29:

> NIPS exemplifies the heavy-duty file processor which has been the mainstay of the Department of Defense command and control and intelligence data handling. In its current version, this system incorporates a comprehensive on-line capability which further enhances its adaptability to today's processing requirements. The evolutionary approach continues to be the foundation of the system's development. The validity of this approach is increasingly apparent as the number of users and applications increases. For application areas with high-volume and large file-processing requirements, NIPS provides a convenient, efficient, and flexible method of solving the data handling problems in the third generation hardware and software environment.

NIPS is the largest, best established and staffed data management system. It has been refined, evolved, and "de-bugged" for over five years. (The Census Bureau's DIME geo-coding information system, in contrast, is a relatively recent entry and has not had the staffing or de-bugging needed to perfect it.) At the present time, Computer Science Corporation is re-writing NIPS into the computer language COBOL. It will be ready in four

years. Undoubtedly, in keeping with DOD policy to date, this will again be an evolutionary advancement and will be compatible with the totally new IBM computer line that, it is said, will be marketed beginning in 1976.

NIPS was designed for the large file capacity needs of DOD, to be able to call up and display information coded on a geographic basis for any given area in the world. Records of 100-150,000 and more are handled. It can more readily manipulate 20,000, and with 5,000 records its performance is outstanding.

Recently, the Department of Transportation's Office of Systems Analysis & Information has examined and tested NIPS for application to its transportation planning needs. Basic publications it has generated in this process include:

NIPS 360/FFS - AN EVALUATION - Final Report, December 1972;

A SURVEY OF NATIONAL GEO-CODING SYSTEMS, February 1972;

THE NATIONAL GEO-CODING CONFERENCE - Proceedings, May 1972.

Inquiries concerning NIPS civilian applications might best be referred to the Chairman of the Formatted File System (FFS), Commercial Users Group: John Bright, Western Electric, P. O. Box 20046, Greensboro, North Carolina, 27407 - 919-697-3370.

Characteristics of Significance - One doesn't have to read far into the subject of geo-coding before questions are encountered, such as "Should there be one super-system or should interchangeability between a large number of national geo-coding systems be developed?", "What data should be collected and at what geographic scale?", "How is sufficient consistency achieved and for what users?".

NIPS probably offers the most perfected basis to date of geo-coding, storing and manipulating data for the purposes of regional policy-making. Data for specific geographic areas can be searched according to the characteristics of a given problem. Or, according to criteria, geographic areas delineated. The output can be either alpha-numeric or graphic display.

III FIVE REGIONAL APPLICATIONS

VANCOUVER, B.C. - Regional Simulation Study

Resource Science Center
The University of British Columbia
Vancouver 8, Canada
(Robert F. Kelly, Project Coordinator - Gil Evans - 604-228-3131)

The Inter-Institutional Policy Simulation, or IIPS, is a joint project of city, regional, provincial, and Federal governments and the University of British Columbia. IIPS is a five-year project begun in June 1970 with the assistance of a $500,000 grant from the Ford Foundation (believed to be less than half the total cost now.)

IIPS' object is to get people working together to build a model of the Greater Vancouver Region using mathematics, logical concepts, the University's IBM 360/67 computer and a project-purchased $47,000 analog computer. (The analog computer allows researchers to simulate a total environment and the digital computer to handle the mass of mathematical data that the new program will generate.)

The first three years work has been an analysis of the region, developing the overall program, and its ten submodels, and the gathering and coding of data. The fourth and fifth year will be spent in testing and refining these models. "By 1975 it is hoped a working model will be available for people to test the possible consequences of alternate policies which would affect the future of the Vancouver area." Though staffed predominately by university researchers and students, and coordinated with governmental agency staff, it has been the hope of IIPS from the outset to provide a "futures" testing vehicle for citizens, politicians and civil servants alike.

IIPS is intended as an early warning system for the region. It is intended as a way to raise alternative choices and test for their consequences. Basically, IIPS is a sophisticated way to learn how to ask better questions about the working of the vast complexity of interrelationships in a metropolitan region of one million people. It is not an automatic decision-maker.

"To operate the IIPS model, one might sit at a keyboard and type in one's questions, ideas and pet policies. The consequences in the simulated world of the model would be shown on a screen in the form of charts, graphs or printed words. Computer terminals are planned at several points in the region ... IIPS strength will be in allowing

people to preview the possible outcome if their pet theories were implemented. Its limits are that it will not answer questions in detail ... IIPS will not assume a real planning function; people in the region will do the planning, using IIPS to help understand the complexities of the whole region."

IIPS has developed ten submodels that all react with each other to simulate the functioning of the region. The total model is a complex simplifiction. It is not reality. It is too simple for that. But it is complex, although intended to be simplified enough to be understandable (by examination) and capable of handling available data.

Submodels of the IIPS are:

population and demography
economics
transportation
health systems
pollution
human ecology
land classification
data management
resources and public services

The submodels are linked by the flow of information from one to another. - "By making certain that each of the submodels provides the information needed by the other submodels, we are ensured that the information flows will be complete and will closely imitate the real flows in the Vancouver Region."

Characteristics of Significance - The following is another quote from the first of the four papers referred to at the end.

"The Vancouver Regional Simulation Study is a bundle of paradoxes. It seems like an exercise in numbers to produce a model - and yet it is not. It seems designed as a service to the bureaucrat and technician - and yet it is not. It seems to assume that the quantifiable variable is by definition the important one - but in fact it does not. Rather, its central purpose is to provide an environment for the institutions and citizens of the Vancouver region to develop a dialogue about the alternate futures open to the region.

Effective dialogue, however, can only be developed if there is a common ground of substance that can trigger and focus the dialogue. We have, therefore, designed a programme in which the first steps were largely technical - basically to develop a simulation model of

man/environmental interaction in the urban regional setting of the Lower Mainland of British Columbia. By inter-relating as much as is known of the economic, social, physical and environmental processes in the region within a model, with the unknown and the qualtitative outside the model, it was hoped that regional problems could be more explicitly identified and placed in an objective environment for community discussion. In this sense, therefore, that part of the world that can be simulated could become a powerful instrument to explore the consequences of different assumptions and policies, any one of which can generate an alternate future.

We know from experience that even modest simulation modelling efforts to interrelate parts of a system confront the person entering the simulated world with paradoxical and unexpected results. The human reaction to the unexpected and to the paradox is to ask a question, and if there is anything we need now, it is an environment for asking better questions. The key of our approach, therefore, has not been to design a model that will produce unique solutions and in itself specific policies, but rather to produce a process by which the institutions and citizens of the region could pose better questions."

IIPS has discovered that challenging and significant as developing the simulation model is, developing a framework for its responsible use is much more so. "It is this latter challenge that makes the project a fragile and groping experiment."

The University base for the project was vital for this model development (UBC happens to be a university more blessed with a predisposition to interdisciplinary work than most.) But the ability to construct models and deal in conceptual abstraction which is possible in such a place may permanently outstrip the comprehension of the ultimate user -- the government official and the private citizen. Newspaper accounts, write-ups by University participants and discussions with them indicate the necessity to involve people more effectively from the outset. Citizen understanding and involvement is only now being urgently sought.

"By handling the complex technical detail, the model can free people to concentrate on the non-technical issues - questions of goals, values and the ingredients that define quality of life as each individual perceives it. What is really important, therefore, is not what is put into the model, but what is kept out; not just how to provide a mechanism like a model to handle the quantitative, but

also how to design a decision-making framework to handle the qualitative; not just to develop a useable model, but to determine how it is used. The greatest challenge to the project, therefore, is whether, in cooperation with the citizens of this region, technology can be harnessed to man's needs."

"There is also the hope that a way can be devised to allow the transference of the activity to different institutional auspices. With so many institutions involved, so many constraints, and such historically ingrained institutional patterns of behaviour, this is a non-trivial job. It is, in part, what IIPS is all about. How can institutions with such different goals, with individuals of such different motives, come together and act in a cooperative spirit to a common purpose when they have for so long remained separate? "

See these publications which are liberally quoted for this report: Vancouver Regional Simulation Study, 1970 - 1971, M.A. Goldberg, C.S. Holling, and R.F. Kelly; Vancouver Regional Simulation Study - Second Year Report 1971 - 1972 - Section "A" Overview of Project; IIPS Detailed Description of Sub-Models and IIPS, Resource Science Centre, University of British Columbia, Vancouver 8, B. C.

DES MOINES - IMIS - Geoplanning

Integrated Municipal Information System
City Hall
Des Moines, Iowa
(William Batske - Battelle - Northwest, consultant
James Furst - City Planning Director - 515-283-4141)

This fifteen month research and development program, for which the City of Des Moines is the prime contractor, is a project of the Urban Information System Inter-Agency Committee (USAC). USAC is composed of ten federal agencies and departments led by HUD. USAC is assigned the responsibility for refining the objectives of a research program in urban information systems which:

(1) performs research, develops, tests, evaluates and documents systems and sub-system prototypes;

(2) develops prototypes which are transferable to other municipalities;

(3) includes readily comparable elements of data; commonly defined; and

(4) operates at favorable cost/benefit ratios.

The Des Moines project IMIS, for Integrated Municipal Information System, "focuses on the development of geocoding techniques and system methodology in addition to development of a sophisticated Geographical Information, Planning and Analysis System. Using a Master Base Map and Grid System, Map Model System and the Formated File System, the city of Des Moines hopes to demonstrate that municipal data or urban environment data can be easily and effectively integrated with specifically designed geographic structural file."

Des Moines is a metropolitan area of about 200,000 people. For the purposes of this demonstration, a pilot area of about 21 square miles in the southeast quadrant of the city was selected. A Des Moines/ Polk County Program/Users Committee of 25 plus was established for the project. The long range objective is to provide data/information geographically coded for the entire region.

Functional areas of city and county government which showed interest in geographic coding and display of information included: - Plan and Zoning Commission, Traffic and Transportation, Community Development, Public Works, Finance, Building Inspection Services, Urban Development, Assessor, County Audits and County Treasurer. To limit the data/information for the pilot area only four agencies were selected: Community Development, Planning and Zoning Commission, Public Works and the Assessors.

Des Moines had already embarked on a major data/information system development program before IMIS. It had acquired, and has since updated, its computer capability, and now has a number of computerized municipal data files. Ultimately the various subsystems could comprise a total integrated system with the ability to cross-reference data between various on-line files. "Many Des Moines agencies need and collect data, but their resources and methods for gathering and maintaining their data vary. The system concept developed by Battelle, GEOPLANS is designed to recognize these limitations."

"GEOPLANS is the acronym for GEO graphic PLanning and ANalysis System. It is a system for effectively relating vast stores of data to geographic locations. It provides better and more timely information for more effective decision-making." (GEOPLAN uses the NIPS system referred to in Section II.)

Des Moines is experimenting with "a geographical reference identification method for data storage and retreival and for linking various

data source files. GEOPLANS' common identifiers are directly applicable to the needs of spatially oriented planning. This spatial, geographic orientation can be (mapped) State Plane coordinates, legal boundaries, street addresses, or artificially created grids of polygrams."

The Des Moines pilot project is being tested this summer. Publications available for review of this approach include, Geoplanning Research Program, System Conceptualization, Des Moines, April 1973, USAC-DM13-0002, which includes an excellent appendix paper on the state-of-the-art of geocoding technology and urban data systems.

See also GEOPLANS a Geographic Planning and Analysis System by Battelle Memorial Institute/Pacific Northwest Laboratories, Richland, Washington 99352.

Characteristics and Significance - A primary characteristic of the GEOPLANS design is that while it involves the application of modern automatic data processing, testing it does not require exotic computer equipment or radical changes in current procedures. Present computer equipment, with adaptations, will do. Current agency responsibility for updating and correcting data remains. A common geographic reference index relates data files in different agencies to each other, and is used to call forth data.

The potential appears to be enormous for this system; much more so than previous thoughts of creating one massive data bank for all required regional information. But accurate data base maps are essential for the GEOPLANS system. (New York City is said to have 10,000 different maps and no one base map. The New York City Planning Commission decided that plotting and digitizing coordinates (NIPS-style) of the various polygons of city blocks, zoning, etc., for so many different base maps - most of which are not compatible with each other - was too slow, too tedious to attempt. Des Moines uses aerial photography for its base map, which was easily controlled and could be digitized readily. Most information reads well at such low density.)

The New York example is brought in here for the purpose of introducing computer graphic scanning as the means of plotting base maps and data. This is now being tested by the New York City Planning Commission (2 Lafayette Street, New York City, Rolf Moulton 212-566-3982). Instead of devising a system of digitized coordinates for the millions of polygons that are involved in New York City, maps are scanned by computer for which programs covering discrepancies have been written. By this much faster means, graphic

map information can be input to computers in combination with hand work corrections on the maps. This approach can be used to provide "real-time" maps which integrate basic data.

The important point here is to recognize that the practicality of computer assisted graphics is that (1) one master base of all data is not needed, but one geographic reference index is and (2) optical scanning by computer may become the most efficient means to input geographically based data into a coded computer format.

SAN DIEGO - IREM

Integrated Regional Environmental Management Project
County of San Diego
Environmental Development Agency
1600 Pacific Highway
San Diego, California 92101
(L. Edwin Coate, Director - Larry Taylor - 714-236-2005)

In 1971, San Diego County consolidated various environmentally related functions, including regional planning and community zoning, into a new Environmental Development Agency. It reports to the county's Chief Administrative Officer who is responsible to the County Board of Supervisors. "Rapid growth and land use planning with insufficient attention to its implications for air quality ..." were cited in a recent report by Director Coate (see first publication reference.) It seems San Diego has 60% more days than Los Angeles when weather conditions could lead to a serious air pollution situation.

The Ford Foundation in April 1971 came in to assist this new effort, to help determine what environmental management is and how effectively it could be accomplished on a regional level by government. A two-year $725,000 grant was made to establish the IREM project staff, located in the Environmental Development Agency. It operates with 30 people, consultants, university contracts, and other governmental agency staff. Both EPA and NSF also came in with additional support funds.

"The IREM project's purposes were to work within county government to:

1. respond to Federal and State legislative requirements;

2. mobilize community resources and support decision-makers;

3. respond to citizen's concerns as articulated by the Board of Supervisors;

4. enhance the regional image, and

5. provide a rational approach to environmental issues."

The program divided itself in two. One section provided regional environmental service such as project environmental impact analysis, community involvement and economic analysis. The other part of IREM was directed to program management which included policy development and technical management of research, development and demonstration projects.

A major effort of IREM was to develop a natural resource inventory for land use and decision-making; and computer graphic techniques were developed by IREM for regional land use projects. Staff and functions defined by the IREM project are to be absorbed by San Diego County.

Characteristics of Significance - To quote further from Director Coates:

"From the IREM case study, it can be concluded that, to be most effective, regional environmental management must relate agencies involved in land use and transportation planning to those which are responsible for regulatory pollution management functions. An effective regional environmental management agency must have linkages to all the key environmentally related institutions in the region. The IREM experience also led to the conclusion that effective regional environmental management had to be carried out with some type of authority or under a definite mandate. Advisory functions and research and development functions were necessary and important, but proved inadequate by themselves. IREM, located as it was in a County government, could not effectively fulfill all of these various criteria.

"The regional concept for environmental management is not only valid; it is essential. We have finally begun to question the efficacy of institutions that deal with environmental quality at all governmental levels. The resulting analysis leads to the conclusion that a new type of regional institution must be created."

See publications: County of San Diego, Regional Issues, Volume 3, Environmental Information System: Basic Concepts, County of

San Diego, Environmental Development Agency, IREM (August 1972); The Coastal Plan of San Diego County, Laboratory for Experimental Design, California Polytechnic, Pomona, for County of San Diego, Environmental Development Agency IREM (August 1972); Geographical Data Handling (Volumes I & II), Edited by R. F. Tomlinson, Symposium Edition, International Geographical Union Commission on Geographical Data Sensing and Processing, Second Symposium, Ottwa, August 1972; A Study Program Organization and Operation, ERMS, San Diego County, IREM Program, December 1971

COLUMBUS, OHIO - Benchmark

The Academy for Contemporary Problems
505 King Avenue
Columbus, Ohio 43201
(Ralph R. Widner, Academy Director - 614-299-3151)

The Academy for Contemporary Problems was established in 1971 as a joint non-profit venture of Battelle Memorial Institute and Ohio State University. Each is committed to $500,000 per year for ten years, and Battelle in addition has financed the construction of a $2,000,000 complex to house the Academy, which will be occupied this Fall.

One of the Academy's first areas of concern is an activity to be supported in several metropolitan areas entitled BENCHMARK. It stems from a Resources for the Future committee position that "too often decision-makers' conception of metropolitan reform and the problems perceived by the metropolitan constituency have been widely disregarded ... BENCHMARK is an attempt to provide continuing data concerning the problems existing and emerging in a metropolitan area, to assist metropolitan decision-makers in making more effective public policy ..." The original test area for this work will be the Columbus metropolitan area which has a population slightly in excess of one million persons.

This public policy research effort will be identified as the Columbus Area Social Profile, or CASP. It "will be a social system -- an organization comprised of research performers, community leaders, neighborhood groups, and individual citizens ... CASP seeks to

serve the short-term information needs of public and private organizations and voluntary associations in the Columbus area by providing reliable data on public opinion, attitudes and practices. Data on basic social, economic and ecological conditions will be related to the needs and aspirations of people living in the Columbus area... CASP intends to service a variety of community needs related to self-knowledge and hence to self-government."

CASP is designed to integrate regional information from the wide variety of sources continually providing it. CASP will attempt to provide a comprehensive framework for better understanding issues and resources. To aid in this, CASP is a private social profile of institutions and neighborhoods within the region. It is intended to provide users with a new instrument to audit, over time, trends, aspirations and satisfactions.

The principal goal of CASP is "to provide an informative base that will be maximally useful for diagnosing social strengths in the Columbus area." It has tentatively established goals from which more specific objectives will be derived and pursued with explicit actions. CASP is preparing to expand its preliminary organizational form, inventory institutional and individual resources in the area of value to its mission, gather data, develop an archive, identify issues, etc. Projections of alternative futures for the Columbus area are to be prepared leading to selection of policies. Both integration and evaluation are integral aspects of CASP.

Characteristics of Significance - In the Academy's "mind" is Harold Lasswell's conception of a "social planetarium" for graphically conveying CASP's sort of information for the purpose both of explication and analysis for decision making. Taking a paragraph from a recent Lasswell paper for the Academy:

> If decision-makers are to arrive at a critical assessment of the factors that account for the spreading or the restriction of nations, corporations, and doctrines, they need access to whatever scientific knowledge there is. Now it is no simple matter to apply past laboratory findings to the interpretation of future developments. In the laboratory, conditioning factors are controlled. In weighing the future, the task is to foresee the cluster of factors whose occurrence will influence the outcome. An advantage of the planetarium procedure is that scientific knowledge can be exhibited and employed critically in estimating the probable course of future developments.

There is particular strength in the Ohio State - Battelle-based Academy. It is Battelle's geo-coding capability that is built for the Des Moines

region; reported elsewhere in this section. Battelle, one of the world's largest research firms, has a wealth of other hardware/software talent, and in Widner, an experienced regional development executive. At the Ohio State there is an array of talent which includes computer-graphics skills already capable of computer assisted animation.

See publication: BENCHMARK/CASP - A Public Policy Research Effort to Help Improve the Governance of Metropolitan Communities Through Improved Use of Social Intelligence, Mershon Center for Public Policy, Academy for Contemporary Problems, 1973.

NEW YORK - RPA - TV Town Meeting

Regional Plan Association
235 East 45th Street
New York, N.Y. 10017
(William A. Shore, Vice President - 212-682-7750)

With HUD, foundation and other support totaling about $1,600,000, RPA experimented in the Spring of 1973 with an original filmed series of one-hour films for broadcast television on the theme Choices for '76. (Regional Plan Association was started in 1922 by the Russell Sage Foundation. It is probably the most respected volunteer citizens, non-profit planning association in the United States and has pioneered in regional planning.)

The six television programs covered transportation, environment, poverty, housing, cities, and government. Each program was used three times in a series of three-day weekends on each of eighteen television stations in New York, New Jersey and Connecticut, from March 17 to May 14, 1973. A concerted effort was made to organize citizens around television sets in advance to participate in this new form of Town Meeting. They were provided with ballots to "vote" on specific issues as posed during each program.

(A paperback book, How to Save Urban America, (Signet), 1973, was published to coincide with and be used by this series. It was available on newsstands throughout the region.)

From its June, 1973 Newsletter, RPA reports:

"Who took part? The participants had more education and higher income than the Region's average, despite strong efforts to recruit those with

an average and below average income and education. Those earning $8,500 - $13,000 were represented in about proper proportion, but those below were very underrepresented, those above overrepresented. A third of the Region has an income above $13,000 while two-thirds of the ballots came from such people. About half the ballots came from persons with college degrees, but only one person in eight over 21 in the Region has a college degree. Black and Puerto Rican votes were 5% - 8% of the total, while they constitute nearly 20% of the Region's population (though special ballots distributed by the Committee on Minority Affairs will add to those received already). As to age, 30 - 44 year olds were overrepresented, over 65 year olds were underrepresented. Inner suburban counties were overrepresented; city and outlying counties generally underrepresented. However, on some two-thirds of the issues, a majority of people (or all but a statistically minor category) voted in favor of policy changes regardless of their age, race, income, educational background or county. Those issues are starred in the vote summaries (not included here).

Participation:

	Watched TV	Returned Ballots
Housing	2.95 million	47,500
Transportation	2.0 "	32,200
Environment	1.75 "	22,500
Poverty	1.5 "	18,500
Cities/Suburbs		12,500

What Do the Votes Mean? We cannot say that the votes tell where the people of the Region now stand, but we can say of the starred issues that people who stop to consider them are ready to support proposed remedies. This suggests that elected officials willing to exercise political leadership probably can achieve policy changes.

What's Next? Regional Plan will report results in public meetings and via mass media. We will get results to officials and candidates for public office and ask their comment. Three of the major candidates for Mayor of New York City have commented already. See New York Times, May 12, 1973. We will try to bring together people who want to take action (on any of the issues) with organizations working on their side. We will try to assist civic action on behalf of a few issues that seem ripe for resolution. At the same time, Regional Plan will prepare a thorough evaluation of the project both to understand its implications and to assist the many groups in other urban regions now considering the same kind of program."

Characteristics of Significance - RPA is now surveying the participants and will be reporting on the effect of the Choices for '76 television series in the Fall. It is significant that 1.5 - 3 million people of the New York region's 18 million took part. Even though not represented in their true proportions, all groups tabulated were large enough in number to provide a scientific sample for cross tabulation by age, income, education, etc.

It appears clear from examining the ballots processed so far, - seven to ten multiple choice questions were asked with each program, - that a majority of viewers seek major development policy changes to achieve better living in the region.

IV NINE SYSTEMS OR COMPONENTS

TICCIT - Computer Controlled Information Television

The Mitre Corporation
1820 Dolly Madison Boulevard
McLean, Virginia 22101
(Richard Morton - Kenneth J. Stettin - 703-893-3500)

TICCIT (for Time Shared, Interactive, Computer Controlled Information Television) is a two-way interactive cable television system. It has been funded by NSF over the past 5 years. MITRE's emphasis is on educational and other non-commercial applications of interactive computer assisted communication. It has two developments underway at this time. One is to be a home-use demonstration available to 3500, utilizing Touch-tone telephones and the cable system of Reston, Virginia, beginning in September, 1973. The other is a fully operational demonstration in two community colleges beginning in September, 1974, each with 128 student terminals consisting of TV receivers, keyboards and headsets.

The student terminal uses a standard color TV receiver, head phones and a keyboard for instructing the Data General Nova 800 mini-computer. The home subscriber will use a Touch-tone telephone and a standard color TV receiver to begin with. (Later a twelve or sixteen button keyboard, or a typewriter keyboard will be offered.)

Both configurations offer color TV displays under computer control, letters and numbers and line graphics, in seven colors, and full color movies. Up to 17 lines of 41 characters each may be displayed, 512 distinct characters being definable at any single time. Graphic displays are constructed from straight-line segments drawn on a grid of 200 elements in a vertical direction by 256 elements in a horizontal direction. The color of each character and line segment may be individually specified. Five minutes of full color movies are available per hour. Computer generated graphics are still (not moving) and the audio responses are expected only 10% of the time, varying from one to 40 seconds.

A motivation behind TICCIT is to explore non-commercial applications of computer assisted interactive cable television versus its commercial applications. It relies on already available commercial equipment and is now preparing its development testing phase.

A major impediment for home interactive television has been the need for a "refresh memory" with each terminal. (The refresher memory is the means

whereby the 1/60th of a second still images directed by the computer to a terminal are "held" by being repeated ("refreshed") at the particular user terminal until released by another instruction.) This is said to be reduced to one refresh unit per 20 subscribers by assuming that in a normal 10 hour day, interactive television would be used by each subscriber only 30 minutes. (Later, when the price of refreshers drops from $1,000 to $200 or $300, heavy users might acquire their own refresher allowing them to bypass peak hour queues.)

TICCIT is a realtively low-cost system -- a complete system of 128 student terminals with mini-computer will cost $450,000 ($250,000 in moderate quantities) -- at student-per-hour contact cost of less than $1. In the home with a Touch-tone telephone, a subscriber rate of $14 per month is projected.

The TICCIT system uses two Data General NOVA 800 mini-computers. One is a time-sharing mini-computer with storage and other peripheral equipment; the other processes communications with the terminals. TICCIT provides interactive information retrieval displayed on the television screen, which is augmented with certain computation capacities. There is a distance restriction of 1500 feet between classroom and computer. In home cable TV application, that distance is limited to normal "head-end" constraints of 10-15 miles.

The school courseware of TICCIT is developed by a team of specialists, for mass distribution, though instruction is self-paced. The TICCIT approach is that of "instructional technology" which contends that the strategy of teaching is separable from the content. In other words, standardized approaches to interactive learning can be developed to handle almost any subject matter. In this, the dominant role of the individual teacher in the learning process is replaced by "packaged" self-paced instruction.

Characteristics of Significance - TICCIT is ready to be experimented with now, where there is cable television and Touch-tone telephone service. (Its most complete demonstration as a system would be where two-way cable television would be in place in 1974.) At this stage, the $150-200,000 Data General Nova 800 mini-computer, refreshers, etc. are needed for each 200 subscribers.

TICCIT's capacity to compute is not expected to compete with PLATO. It is designed for the growing capacity of mini-computers, retrieving data from their inexpensive storage. TICCIT displays color television images, but there are built-in limitations on motion and color in its present configuration. (What fewer TICCIT terminals - for policy-makers - would make possible has not been estimated.) The "drawing" abilities of TICCIT do not equal the "naturalness" of PLATO, but for some purposes still graphics may be enough.

In TICCIT "normal" motion is restricted to that displayed via video-cassettes which are loaded by hand at the "head-end" when called for. However, a stop-motion capability is possible. As to color, although seven can be used, they are assigned within a grid system 200 units high by 256 units wide on the standard TV screen. This means continuous tone color of irregular objects is not possible, nor can colored lines which cross one another maintain their single color.

PLATO - Computer Based Instruction

Computer Based Education Research Laboratory
University of Illinois
Urbana, Illinois
(Donald L. Bitzer - D. Alpert - 217-333-6210)

PLATO is a computer based teaching system which has reached a fourth generation stage in its 13 years of NSF supported development. PLATO IV consists of a Control Data Corporation 6000 computer designed to serve 4000 terminals and a software system which includes its own simplified programming language, TUTOR. Response time of the visual displays it either generates (and they can be animated graphics) on a flat plasma glass panel, or from rear projected slides, is .2 seconds. The latter are projected from one of the 256 colored images on microfiche film. (The 4"x4" microfiches are prepared by University of Illinois, color-corrected for viewing through the plasma panel -- which is slightly green in tint.) Audio messages, over 4000 of them, are accessible in .5 seconds from a record with 21 minutes of sound. (The special computer activated record player is $1500.)

The plasma panel developed in the last year or so is 8 1/2" square and filled with neon. It is transparent, flat glass with 512 transparent electrodes traversing it both horizontally and vertically; 262,144 individual digitally addressable points are under computer control -- which may be activated by the keyset. By touching a special overlay panel, 256 points can be activated. (The extra cost of the touch panel is $600.) All manner of line drawings, charts, graphs, etc., different type sizes, styles can be generated, and in motion. The plasma panel permits connecting the computer to terminals by means of ordinary telephone lines.

The software that is used programs concepts which can be interrogated within the limits of the data base and vocabulary related to specific programs. Programs can be developed at any terminal by anyone (including simple ones by children "instantly"). Familiarity with the system's programming language, TUTOR, is said to be a matter of a few hours.

Servicing 4000 terminals on a time-share basis, with computed responses, including the use of "judgment" algorithms, requires a powerful computer.

Characteristics of Significance - PLATO can "draw" its orange graphics on its terminal panels in such a "natural human" manner, in response to queries put to it, that the effect is disarming. The questioner seems to see into the meaning of his question partly because he is able to type in his own questions and partly the way the graphics are drawn. When a map or an illustration stored on the microfiche is wanted, it "instantly" appears, rear projected into the same plasma panel and, if he chooses, he can then "draw" on it with his finger, (special panel, see above) or by means of keyset inputs to the computer.

No doubt mechanisms to store and "instantly" project 8 mm movies as well as slides could also be developed, but television (and video-cassettes) would require a separate television screen. (This is an important consideration and may call for a hybrid system, once mechanisms for computer accessing video-cassettes and selection from within their programs is achieved.)

One terminal ($5500) and its yearly operating costs of $2200, plus long distance line charges, makes PLATO available to a policy-maker (leased long distance charges to Urbana from the West Coast, unless provided on the Federal Telpak Rate of 30¢/mile/month, would be approximately three times that or $1500 per month). Of course, data, programs, microfiches, etc. would have to be developed for the particular use, but as time goes on, a growing share of that would be available from studies done once, nationwide. And in time a PLATO terminal and the PLATO system could be interfaced into the ARPA network, bringing down costs and tapping expertise and computing capacities all over the country. Also in time, the PLATO computer installation at Urbana would be replicated at various locations throughout the country.

PLATO provides an interaction, particularly with its responsive "drawing" of graphics and slide retrieval, which is intended for one user. Its effectiveness for a large audience, via a television camera focused on the PLATO plasma panel, may be another matter. Also, the bulk of each terminal, approximately a 30" cube, blocks off one user in the same room, from another. PLATO is intended for individual instruction, providing drill, simulation, and means to stimulate critical thinking and it does that very well.

Other than that, PLATO is also a one-to-one learning technology which stresses self-paced learning, utilizing computer assistance and graphic display; TICCIT and PLATO could hardly be more different.

PLATO needs 4000 terminals to begin to be cost effective, unlike the 128 terminal self-contained system of TICCIT. Also PLATO does not use a standard TV monitor. It has a plasma screen onto which still or moving pictures can be displayed (if previously loaded into the individual PLATO terminal). But PLATO does provide moving, line graphics on a time-share basis as a response to the user's own queries. Neither of these is possible with TICCIT. But neither are seven colors possible with the PLATO plasma panel, only the one color, orange.)

Concepts are stored in PLATO and actual computation produces response, not data retrieval. Stored data and pre-programmed questions are stored in TICCIT, supplemented by a limited computational capacity. (It is said storage of data is inexpensive and that a great enough experience will anticipate the bulk of the questions, so that for certain instructional use, TICCIT has adequate capacity. TICCIT is more rote-like than PLATO. Its content matter may be limited to certain areas - which? And will PLATO's sort of movement be missed?)

PLATO is easily "authored" by the user. This both puts the individual professor at the center of his own course development and frees him for work with individual students. He is not displaced by a "presenter", but may lack the imagination and media competence to make full use of his PLATO terminal. (The TICCIT counter to this is that 1 out of 4000 teachers is published and that this is a fair measure of those capable of developing their own courses.)

PLATO is especially surprising in the easy way it "accepts" unprogrammed questions, "deducing" their sense out of misspellings, etc. -- as long as the query is within the program's vocabulary; and it "judges" responses. Of course, it cannot answer every question of every policy-maker, but it can relate the total effect of changing one or a number of variables in a programmed "concept". Perhaps programming is so easily managed that PLATO can be quickly brought to handle such a high proportion of exploratory questions that a policy-maker would be attracted to use it and forgive the times it took a day or a week to respond.

The student-per-hour contact cost at the optimum loading of the 4000 terminals for PLATO IV is down to 35¢ per hour. This is said to be comparable to normal size elementary teacher-led classes. It includes the $2.5 million main frame cost of the computer, two million words of memory and other input-output equipment costing $2 million and another $1.5 million for software (amortized over 5 years), plus operating costs. (Some have questioned if PLATO can handle more than 2000 terminals.)

HumRRO - Color Halftone Area Graphic Environment (CHARGE)

Human Resources Research Organization
300 North Washington Street
Alexandria, Virginia 22314
(Dr. Ron Swallow - 703-549-3611)

HumRRO, established in 1951 by The George Washington University as a non-profit corporation, was under exclusive Army sponsorship for its first 16 years and developed technology of training and education as well as research into motivation, leadership and personnel management. In 1967 this competence was extended to other federal agencies and to state and local governments. The relationship with The George Washington University was terminated in 1969, providing it new flexibility as an independent non-profit corporation.

HumRRO, it can be seen, entered the technology of computer assisted instruction with a particularly rich concern for practical educational applications. The reason for including HumRRO here is that it has recognized the different virtues of TICCIT and PLATO and has developed a system that is said to combine those virtues and enhance them at competitive costs with greater flexibility in the number of users. The HumRRO system uses a standard color television monitor for display, as TICCIT does in a more limited way, and provides for animated response that TICCIT cannot do and exceeds PLATO in realism and speed. (The CHARGE terminal is now being built. The image generator, which requires about $200,000 support and one year's work, has not been funded.) The proposed design is economical for a system with as few as 100 terminals, yet modular for expansion beyond 1000 terminals without duplication of text storage-retrieval subsystems. All text material is centralized with little or no need for films, or visual materials at the terminals. The power of the system's special-purpose hardware produces cost-performance gains which are orders of magnitude above that possible through the use of a general-purpose computer and software.

Essential elements in achieving this advanced design are summarized in HumRRO working papers as follows: (1) terminal architectures which incorporate new solid state devices, i.e., CHARGE terminal (Color Halftone ARea Graphic Environment); (2) special-purpose hardware to take over well defined and stable software functions, i.e., image generator for graphics transformations from 3-D to 2-D; (3) eliminating I/O bottlenecks within the central computer system by using high-speed drum swap and building a few special interfaces where necessary; and (4) the latest computer CPU and RAM components for mini- and midi-computers where more production cost effectiveness can be realized.

Described by means of x-y-z coordinates, 3-D objects can be "stored" in the computer and converted to 2-D, colored shaded perspectives on the CHARGE terminal. The objects can then be either rotated and move themselves, or be moved through, by means of a keyboard or control stick. A new perspective can be calculated, transmitted and displayed in .15 seconds, changing perspectives, moving closer. "All of this can be done in vivid color, with curved surfaces appearing smooth".

The CHARGE terminal "resolution ... is of the order of 2000 horizontally and 1000 vertically, actual picture quality being limited by the color monitor" capable of altering the displayed picture at real time rates, rather than that presented through the monitor ... without flicker. (18 bits of color are used and the gray bits are of the order of a 7-bit log scale.) The terminal is estimated to cost $10,000 or $6,000 in quantity. Up to 200 terminals can be supported by an image generator costing around $100,000, permitting real time image generation in 5% of the terminals.

Evans and Sutherland, and GE have developed graphic terminals that generate color perspectives from 3-D objects. Both are limited to one terminal costing approximately $250,000. (See page 54)

The proposed CHARGE terminal system is said to be 15 times faster than that developed by Evans and Sutherland and its output is a model picture (coded as a set of edges) which reduces the requirement on a terminal refresh buffer from 42.10^6 bit to only $1/410^6$ bits. In contrasting the complexity of the images that can be generated, CHARGE handles 64,000 edges, Evans and Sutherland 3000, GE 250.

Characteristics of Significance - HumRRO's system combines realism in continuous tone color, perspective and movement with responsive capacities which exceed those of PLATO. A virtue for the regional policy-maker using CHARGE is to "experience" proposed developments before they are built and to share this experience with interested citizens. How will new projects appear? What would it be like to move through them? Concepts that require color, perspective and motion to help convey their meaning spatially and over time could be described and graphically displayed.

Further, by being compatible with standard television, one central storage system for a region could convey all manner of information to single terminals, for large screen projection in regional situation rooms or to a whole community television audience. With two-way cable capabilities, many terminals could view the same image at one time and participate in altering it. A further advantage of CHARGE, and TICCIT, is that the "refresh" hardware for a number of terminals can be shared, thereby reducing cost. This is not possible for PLATO in which the refresh unit has to be built into each terminal.

One system could encompass community graphic requirements from education to general community dialogue and policy-making. This one system could handle (1) real time image generation, (2) live broadcasts, and (3) videocassettes.

From HumRRO reports, the following comparison can be made of its CHARGE system to TICCIT and PLATO:

	CHARGE	PLATO	TICCIT
display	tv monitor	plasma panel	tv monitor
minimum number of terminals for complete system	100 - 1000	1000 - 4000	100 -
interconnection	tv cable	telephone cable	tv cable
motion	computer generated in full color, line and area	computer generated line, one color, one gray level	hand access videocassette, full color
3-D to 2-D hardware/software	yes	no	no
terminal image resolution capability (points discernible horiz. & vert.)	2000 h 1200 v	500 h 512 v	320 h 240 v
system core (16 bit words)	128,000	256,000	32,000
swap & job lesson size (16 bit words)	32,000	4,000	8,000
response time	.15 sec.	.15 sec.	1.0 sec.
transmission time	.004 sec.	0.1 - 2.0 sec.	0.1 sec.
executable instructions (user/second)	10,000	1,000	3,000
non-echo jobs (peak-seconds - 1 job/user)	1	2	20

THETA-COM - Subscriber Response System

Theta-Com of California
9320 Lincoln Boulevard
Los Angeles, California 90045
(Marshall Carpenter - 213-641-2100)

The SRS is a two-way interactive computer assisted television communication system, a commercial development financed by Hughes. Communication takes place between a computer complex and subscriber terminals. The subscriber terminal consists of a modem, with no operating controls, and a subscriber console, of which there are two models. One model has a 3-digit board, the other a 0 to 9 numeric keyboard and a paper strip printer. They can be installed on either single or two-way cable systems, and a microwave link has been tested. The SRS is designed to respond in a time-share mode to heavy service traffic (50,000 subscribers) within 2.4 seconds, including the recording of billing subscribers on magnetic tape.

This winter 1000 pre-production models of the SRS will be installed in El Segundo, California homes for a dynamic testing of:

New Services:	premium television, restricted channels, frame grabbing, channel polling, opinion polling, interactive education, and audience participation;
Existing services:	meter reading, shop-at-home, reservation services, emergency services (fire, burglar, police) and various derivations of these services.

The modem and console will be provided to subscribers and actual services delivered on a fee basis. The purpose is to test the reaction of subscribers to the services, determine their profitability and the need for change or modification.

The following is from a Theta-Com technical paper:

The CATV system being installed in El Segundo by Theta-Cable is a two-cable system, shown in Figure 7.[1] The system consists of an "A" cable system and a "B" cable system. The "A" cable trunk line is intended for downstream transmission only in the band from 54 to 300 MHz. The "B" trunk line operates bi-directionally: downstream from 174 to 300 MHz, and upstream from 5 to 108 MHz. The "A" cable distribution system, however, operates bi-directionally with the upstream bandwidth between 5 and 30 MHz. Upstream signals from "A" distribution line are routed

through appropriate low pass filters to the "B" trunk where they travel upstream to the head end and are routed to the SRS Local Processing Center. The "A" trunk, and distribution system, is intended primarily for home subscribers while the "B" trunk is intended for municipal, business, and industrial usage, where the greater upstream bandwidth (5-108 MHz) can be utilized for additional data communication and/or upstream video channels.

The "A" cable system will contain 32 trunk amplifiers and 124 line extenders. The "B" cable system will contain 32 trunk amplifiers and only 4 line extenders, in view of the smaller distribution demand anticipated from the specialized users.

The longest cascade in the system consists of 7 trunk amplifiers and 2 line extenders. Total plant mileage is approximately 30 miles. For the trunk, 3/4" foam dielectric cable will be used and 1/2" cable for the distribution system.

For the El Segundo system, Jerrold SP-1/2/5-2W trunk amplifiers and SLE-300-2W line extenders are used.

Characteristics of Significance - Regional policy-makers on FCC standard two-way cable television systems (with TV cameras) could use the SRS for two-way video communication between specific subscribers, such as government agencies and private citizen organizations.

Two-way use of computer assisted instruction would be possible, but limited compared to PLATO. However, special regional videotape movie productions and stored images could be accessed, and for opinion polling each person polled could be identified. The response time of 2.4 seconds for 50,000 subscribers would probably be considered by policy-makers as "too long". It is said that up to .5 seconds it is difficult to distinguish differences in response time. Over .5 seconds, the difference in the lag time of response is noticeable. A dominant proprietary feature claimed of the SRS operation is how it has combined a mini-computer and software to cut response time for large numbers of subscribers.

Initial production terminals will cost $300-400 each and will be available starting in the last quarter of this year.

TOCOM - Total Communication

TOCOM INC.
P. O. Box 47066
Dallas, Texas 75247
(Charles Low, Vice President and Brian Belcher, Manager, Digital Systems)
214-253-3661

TOCOM has developed an interactive home terminal system for two-way cable television, primarily for commercial applications. It is to be first tested at Irving, Texas, near the home plant, with 1500 subscribers.

This is primarily a computer assisted system for communication, not for processing or instruction. (TOCOM's simple 4-key terminal is said to be mass producible at $125 per terminal versus $375 for Theta-Com or, as I have been told, $600 for the RCA terminal). The TOCOM system can respond to 60,000 remote units every 6 seconds. It can be used to provide burglar, fire and "emergency request" services as well as pay-TV, meter reading, information retrieval, medical monitoring, home shopping, keyboard inputs, etc.

TOCOM, designed for the cable system operator, consists of: (1) the home terminals, which operate through two-way coaxial cable with the standard home television monitor; (2) a computer controlled central data terminal.

The home terminal is a combination 26-channel TV converter and a digital transmitter-receiver with its own unique identification at the central computer (for polling, marketing, billing purposes). The initial subscriber capacity of a system is 2000, expandable to 60,000.

Characteristics of Significance - TOCOM claims to be the simplest (4-key), least expensive two-way electronic system at the prototype development stage, ready for manufacture. FCC rulings of March 31, 1972 require all new cable TV systems in the top 100 markets to be built with two-way capabilities: all the existing systems in the 100 top markets are to be converted within 5 years.

Besides the projected home-to-television studio response, systems like TOCOM and Theta-Com could be adapted for use either within regional situation rooms or interconnected situation rooms. Polling of these limited audiences would seem the most significant first use for regional policy-making purposes.

SCRIPTOGRAPHICS - Data Tablet

Scriptographics Corporation
398 King's Highway
Fairfield, Connecticut 06430
(203-384-1344)

Scriptographics is similar to but different from its competitor the RAND tablet. The Scriptographics tablet senses the position of either a stylus, which can be an inked pen, or a sensor. This signal is conveyed in a stream or point mode, or by remote signals, with a resolution of 100 lines per inch. Data can be presented in Binary or BCD and developed on a cathode ray tube or television monitor. The tablet is 3/8" thick and comes in sizes for 11" x 11" to 36" x 40". Other sizes are available. It can be transparent or not. Prices are in the $2,000 range, plus or minus, depending on quantity, size and options selected.

Characteristics of Significance - This is a simple way to add motion and emphasis to graphic presentations to or by policy-makers. No skill is required. It could become a particularly effective means to communicate via either TV monitor or large-scale projected TV images. On an aerial photograph or chart, for instance, white lines can be "drawn" over the image to add information. With tablets in front of each participant in a regional situation room, any one of them could add to each other's drawing, equation, etc.

EIDOPHOR - Large Screen Television Projector

Datex Division
Conrac Corporation
1600 S. Montana Avenue
Duarte, California 91010
(Kenneth R. Eppele, Marketing Manager - 213-359-5381)

The Eidophor 5070 accepts either the standard red, green or blue television signals or digitized information. Images can be projected up to 30 x 40 feet by this high intensity light system, manufactured by Gretag in Switzerland.

From the Eidophor brochure: "In an EIDOPHOR Large Screen Projector the incoming television signal is modulating an electron beam which in turn deforms a thin oil layer on a concave mirror. This oil layer is the actual picture carrier of the EIDOPHOR system. The brighter a certain spot of the picture should be, the more electrical charges are deposited by the electron beam on that spot and the more the oil layer gets deformed.

The television signal of a complete picture therefore engraves a raster scan relief image into the oil film similar to the flat picture on the screen of a home television receiver. The oil relief on the mirror now deflects the light of a 2.5 kW Xenon lamp and using a dark field optics arrangement containing a mirror bar system it projects the television picture through a lens system onto the large size screen. The outstanding advantage of the EIDOPHOR system is in the use of a separate light source which makes it possible to project large pictures of excellent brightness and resolution. The white Xenon light of the simultaneous unit is split into its red, blue and green components for each EIDOPHOR subunit so that each subunit projects its own color content onto the large screen. Superposition of the three color images produces the true color picture. Automatic electronic registration guarantees a sharp picture at all times. Automatic color correction circuitry further assists in projecting a perfect picture with regard to brightness, color tone and color saturation. The EIDOPHOR simultaneous color system which is compatible with public color television, achieves excellent and flickerfree reproduction of large color areas as well as small details."

The simultaneous color unit, model 5070, has a light output of 3600 lumens, a minimum of 800 lines at the center. (It is said to have a design capability of 2000 lines.) The system consists of two units: the projector which is 41" wide by 44" deep by 74" high and weighs 1060 lbs. and the electronics cabinet 22" wide by 35" deep by 53" high, weighing 465 lbs. The current catalog price is $185,000; Model ED-8, for black and white television, is $65,000.

Characteristics of Significance - NASA uses this system to provide operational information to its large roomful of technicians at the Manned Spacecraft Center at Houston working in normal lighting conditions. It is finding increasing use in large sports arenas for scoreboards and for special effects in television studios. In a regional situation room for television broadcasting, Eidophors can provide a large, brilliant, clear image. It offers the potential for superimposing digital graphics and other data on television images as called for by the viewer. A television camera in a normally lighted room could pick up a large Eidophor image and all the people meeting in that room.

GE LIGHT VALVE - Large Screen Television Projector

Video Display Equipment Operations
Building 6, Room 206
General Electric Company
Electronics Park
Syracuse, New York 13201
(Jerrold P. Gunderson, Sales Manager - 315-456-2562)

GE's large screen television video projector system starts from the same light valve principle as Eidophor, but GE uses a single electron gun for all three colors versus one for each primary color used by Eidophor. Its purpose is the same, but it does not claim the brightness of Eidophor. GE suggests projection of images from 2' to 20', the latter in a darkened room. GE's light source is 750 lumens. The horizontal resolution capability is 600 TV lines minimum. Dimensions for the color model PJ500 are 24" wide by 23" deep by 60" high; weight is 400 lbs. The price is $41,500 and the monochromatic model PJ700 is $30,000.

Characteristics of Significance - GE delivers one quarter the brightness, significantly less color tone quality, and much loss in potential resolution compared with Eidophor - but it does so at one quarter the cost, and requires less complex maintenance. If a large image in a normally lighted room is needed, especially if that image needs to be picked up by a television camera, the GE light valve is inadequate. (NASA's use of the GE Light Valve at the Goddard Space Flight Center is in a large, dimly lit room.)

At a GE demonstration in New York in a darkened room, it was surprising how satisfactory a 10' projected image was when fed from a SUNY videocassette - said to have a resolution equivalent to about 200 lines.

Comparing the GE Light Valve black and white image with a color image at NASA's Goddard Space Flight Center (each 9' in width), it was easy to see how much sharper black and white images are. The major reason is the number of lines of resolution (272) for color versus (800) black and white television images. But there is also bound to be a significant difference in the tonal quality of color images between GE and the Eidophor systems - one electron gun versus three, 700 lumens versus 3200. The two need comparison in the circumstance of a regional situation room to resolve the large price differential. Television coverage, lighting of the room, and detail to be read from the screen are important criteria for such a test.

ARPA NETWORK

ARPA Network Information Center
Stanford Research Institute
333 Ravenswood Avenue
Menlo Park, California 94025
(415-327-0940)

The ARPANET is a government sponsored (Defense Advanced Research Projects Agency) communication system, interconnecting a set of computers across the nation, that provides very fast responses. Its interactive message switching has fostered the development of techniques for computer-to-computer communication.

A goal of the ARPA Network is to provide persons and programs at one location on the Network access to, and interactive use of programs that exist and can be run on other computers wherever they may be in the Network. Over the past three years it has grown to serve over thirty sites, mostly colleges, with over forty independent computer systems connected.

The ARPA Network interconnects by means of wide-band leased lines. Small identical processors, Interface Message Processors or IMPs are placed at each node of the Network connecting each computer center, or Host, to a system of leased 50-kiloband common-carrier circuits. Each IMP can support up to 4 Hosts. A terminal IMP is designated as a TIP. Each TIP can support up to 3 Hosts and 64 computers.

Much time to date has been taken to develop the various protocols to allow communication between the many types of computers, terminals and data formats on the Network.

For government sponsored users, initial costs are $78,000 for a TIP and $54,000 for a 316 IMP. Maintenance costs are $7,000 per year for TIP and $5,000 per year for IMP. Operating costs are $16,500 per year plus 30¢ per kilopacket in excess of 4500 kp in a single month. (A kilopacket is 1000 bits.)

The Network Control Center at Bolt Betanek and Newman, Inc., Cambridge, Massachusetts has overall responsibility for the operation of the communications aspects of the ARPA Network. The Network Center at UCLA regularly monitors traffic and experiments to determine performance characteristics. At Stanford Research Institute, the ARPA Network Information Center helps ARPANET users find resources for their information - handling needs and to help geographically distributed groups collaborate with each other.

Characteristics of Significance - No one region need attempt to amass all the computers, programs and expertise it could use for regional policy-making if it is connected to the ARPA Network. (At present PLATO is not directly connected, but it is technically feasible to do so.) Any user incorporated into the ARPA Network can call on any other user of the Network for a special competence or workload capacity it does not itself possess. Using the variety of programs and computer systems the ARPA Network makes available calls for expertise.

V THREE APPROACHES TO ANIMATION

UCSD - Animated Color Movies Derived from Computer Graphics

Chemistry Department
University of California at San Diego
3262 Urey Hall (Revel Campus)
San Diego, California
(Kent Wilson - 714-453-0200 x1473)

The interest of Kent Wilson and his students has led to a number of short (10 minute) NSF funded color movies to better communicate scientific information. Single frame camera photographs are made, in black and white, of the computer generated line graphics on the face of a cathode ray tube. One by one, the images are photographed and, when run at normal motion picture speed, provide motion. Color is added to the resulting black and white film by means of filters through "aerial photography". Three separate films have been funded by NSF for about $20,000 each and each has taken an elapsed time of 6 months. It is difficult to pre-estimate costs for such work (the subject requirements can vary so), but for students with this knowledge behind them, an elapsed time of 3 to 4 months would be adequate to produce similar productions now.

Of the three films produced so far, the one that shows air pollution over Los Angeles most resembles what a policy-maker and his constituents would use. That film, by means of contour lines that rise and fall over a period of time related to a simplified perspective map of the Los Angeles Basin, shows the status of various air pollutants at specific locations. The effect of the sun daily is clearly shown, as well as where in the Basin the pollution is worse. The movie is derived from data collected at fixed monitoring points in the LA Basin. A program is written which connects by contour lines these points and displays fluctuation of readings in a three-dimensional perspective.

Characteristics of Significance - These films are an excellent demonstration of how understanding can be quickly achieved. Collected data is interpreted into information graphically. A long lecture or a thick report with voluminous tables, with an expert there to read them, is not the way to convey meaning of this sort to a policy-maker--just a short film.

Color is a significant addition to the black and white photography and was added to the film cited above for less than $500. The policy use of this technique would be for specially prepared analytic movie productions in which the factor of time is dynamically shown with motion in relation to a specific geographic area.

UTAH - Halftone Computer Animated Graphics

Division of Computer Science
(Merrill Engineering Building)
University of Utah
Salt Lake City, Utah 84112
(Ivan Sutherland - 801-581-8224)

Graduate students are generating continuous tone animation cells for motion pictures at the rate of 100-200 per hour and believe they could, with other equipment, go to 700 per hour. They use a Digital Equipment Company PDP-10 computer, a 5" cathode ray tube with 1,000 lines and a 35 mm animation camera; a "Watkins-Box" solves the hidden surface problem.

The object being animated is first completely described by polygons located on its surface. (The "points" of the polygon can be numerically defined in relation to each other.) With the assistance of special algorithms (programs or instructions), the area between the points of each polygon is first shaded and then the edge of the plane of abutting polygons is smoothed. An airplane, a face, a building, all sorts of objects have been so described and then caused to "move", one "cell" at a time, by computer instructions which display each cell on the surface of the cathode ray tube which is photographed, one cell at a time, by the animation camera. Additional instructions can work filters into this process which then produces color animation.

This work has developed to this point under the auspices of the Department of Defense through ARPA. Funding has been ended now since DOD claims it has what it needs (simulated aircraft carrier landings from the viewpoint of the practicing pilot in which the ship moves and movement of the plane is responsive to actions taken by the "pilot").

There are 70 students at the Division of Computer Science, about 5 of whom are in halftone computer animated graphics. There is said to be more work to be done to develop more algorithms and especially to devise three-dimensional data measuring and input techniques for this purpose. Continuing funding is now being sought from NSF.

Reports describing this procedure are:

COMPUTER GENERATED ANIMATION OF FACES - Frederic Ira Parke
Computer Science, University of Utah, June 1972, UTEC-CSc-72-120

COMPUTER DISPLAY OF CURVED SURFACES - Henri Gouraud
Computer Science, University of Utah, June 1971, UTEC-CSc-71-113

Characteristics of Significance - This computer generated animation drastically reduces the cost of animation previously done by hand. Both real time and prepared animation can be generated for individual regional study and communication purposes that would have taken too long and been too expensive to even consider before such animation. Aesthetic and purely cognitive concepts too abstract or complex to be visualized or conveyed before will be possible.

HUMRRO - Color Halftone Television Animation

(see description of system in Section IV of PART II)

Characteristics of Significance - At UCSD the result is limited to line, color animation as generated by computer to a standard cathode ray tube (CRT) where it is displayed and photographed one cell at a time. This photography is then run in normal motion picture sequence to simulate action. The UCSD approach is excellent and inexpensive for reproducing line graphics such as diagrams, charts and simplified line drawings on film.

At the University of Utah, Evans and Sutherland, with their $250,000 Watkins Box, etc. can generate, for filming shaded, continuous tone, color animation of irregular objects at costs that are a fraction of hand animation.

HumRRO's system, it is said, will produce color halftone "animation" from computer stored data directly to television monitor display. And it is done with relatively inexpensive terminal and image generator equipment.

The extra capability of the HumRRO system is the "real time" response it can provide once basic images or "sub worlds" are described and stored in the computer system of which it is a part. This permits the viewer to generate graphic response and movement at his command and it too can be used to generate graphic displays of policy analysis. Its natural mode for recording would be on videotape, not film, eliminating processing, delay, expense. It cannot be claimed, however, that television equipment to date can produce the same sharp resolution as film, and in certain cases the preparation of animation ahead of actual use will be desirable or perhaps necessary, making filmed cathode ray tube (CRT) production competitive with "real time" TV display.

VI TWO RELEVANT CONFERENCES

FRONTIERS IN EDUCATION - Purdue University, April 9-11, 1973

This was the third annual Frontiers in Education conference. But it was the first conference sponsored by both the Educational Research and Methods Division of the American Society of Electrical Engineers and the Education Group of the Institute of Electrical and Electronic Engineers. While there were some industry and consultant representatives present, the 500 attendees were mostly engineering professors. The emphasis of the conference plenary and workshop programs was to identify and discuss innovations of "trail blazer educators".

Stress was placed on breaking down the barriers against assimilating new technology into the classroom. The reluctance, even fear, of professors to change their approach was scored - and the implications of electronic means to facilitate education outside the classroom, as well as in it, were repeatedly brought forth.

The conference focused more effectively on self-paced learning than classroom teaching. Innovative findings and experience in educational technology, sociology, educational psychology, and other allied fields were discussed as they applied to engineering education. But the implications of the new educational technology, by the nature of the interactive technology so often at the center of attention, was much broader than engineering education. It seemed to me that education in general, including education of the regional policy-maker of concern in this investigation, could have been included just as well.

Both the content of engineering courses and the easy familiarity engineers have with technology make it natural for education and technology, and practical communication applications of both to society, to evolve in engineering schools. As Ralph Siu said at the 1967 American Institute of Planners conference, perhaps it is the technologists (the engineers) that will lead the way to a new order of learning, to development of a holistic humanism that integrates art, spirit, science and technology. There are many more such technologists than scientists, artists or spiritual leaders and their ego is perhaps less. If the engineers at this Purdue conference weren't openly enthusiastic about the use of new educational technology, they were at least curious, and at worst, fatalistic about the inevitability of its application - once the cost/benefit ratios were worked out.

The state-of-the-art of educational technology seemed to include the use of slide projectors for some! But use of videocassettes, and the latest in self-paced computer assisted instruction was demonstrated and discussed also. Statements about dull professors being replaced by dynamic "presenters" on videocassettes, produced with the aid of educational psychologists, and media specialists, with the professors serving as course compilers and consultants were flatly stated and stolidly received. It appears the engineers are on the brink of really doing "something about it" (education).

Published: Proceedings of the Third Annual Frontiers in Education Conference, Institute of Electrical and Electronic Engineers, 345 East 47th Street, New York, N. Y. 10017. IEEE Catalog Number 73-CHO 720-3E (350 pp. - $10)

KINOSTATISTICS - Washington, D.C., July 27-29, 1973

Bureau of Social Science Research, Inc.
1990 M Street, N. W.
Washington, D. C. 20036
(Albert D. Biderman - Barry M. Feinberg - 202-223-4300)

BSSR in December 1972 published a 50-page booklet KINOSTATICS - Communicating a Social Report to the Nation by research assistant Barry M. Feinberg. Following up that report, the Symposium-Workshop, sponsored by BSSR July 27-29, 1973 in Washington, brought together a remarkable array of skill in graphic communications to discuss how computers, film or television might be used for quantitative communication.

BSSR's particular concern was focused on communicating "social indicators" - statistical measures that reflect crucial states and trends of the country. The twenty-five participants included two New York film producers and Canadian Broadcasting Company TV producers, interaction computer graphic experts, teachers, a Vice President of Computer Image Corporation whose animation techniques are used in Sesame Street, social scientists, symbol designers, a map information specialist, and consultants. It quickly became clear that the graphics being discussed had more to convey than the statistics of social indicators. Kinographics was suggested as an alternate title for this new field of communication.

Films, computer terminals, maps, slides and videocassettes demonstrated the potential capabilities of "graphic language" for conveying information, especially in an interrelated "systems" sense. A number of basic questions about the use of kinographics were raised. What audience? Researchers

or the general public? Would it be used to teach people, or communicate to them? How much simplification before distortion?

Some interactive computer graphics might be just for researchers, but kinographics offer the potential of using symbolic language that is intelligible at a number of intellectual levels to totally different groups. The distinction between teaching people and communicating with them was challenged. It was agreed that simplification is necessary, but must be responsibly done, and hopefully, with interactive computer graphics, at least, subject to testing at various levels of generalization by going to underlying data. The distinction was made between the power to communicate and the power to motivate action.

It was agreed that information could have two distinctly different bases of reference: (1) geography or place, and (2) function, as with generalized national information.

There seemed to be total acceptance of the necessity to develop graphic symbols for social indicators and to test those in State of the Nation-type federal reports. But the need for establishing graphic conventions and facilitating their application seemed to call for consideration of graphic symbols in their total context, which includes environmental and cultural as well as economic aspects. Establishing a clearing house and archive, affiliated with government but organized as an independent non-profit entity and not subject to direct governmental control, was proposed.

Questions about the accuracy of visual communications and their potential impact seemed to call for organizing in a way that precludes the possibility of charges of propaganda.

A demonstration film and a report will be forthcoming from this workshop.

VII VARIOUS OTHER NOTES

(The disclaimer which has already been made about the comprehensivity of this report needs to be "refreshed" for this section especially. Under the man/hour limitations of this contract, it is not possible to report on all the resources for regional graphics. This section briefly comments even more briefly and provides contacts for several more.)

UCD - Computer Driven Regional Model

Department of Zoology
Storer Hall
University of California at Davis
Davis, California 95615
(Kenneth E. F. Watt - 916-752-1558)

Ken Watt has been funded by NSF and the Ford Foundation in his efforts since 1970 to model "society." His Land Use and Energy Components Study to model the State of California has evolved into a series of interacting models that represent global inputs such as weather, resource demands, pollution, population, crop failure, etc. The significance of this work is a demonstrated capacity for simulating the effects of changes in variables upon a modeled system--such as a region.

Queries typed into his San Diego regional model, through a Hazeltine terminal via ordinary telephone lines to a GE time-shared computer (CDC 6600 plus a 7700 and a STAR UNIT located in Indiana), were quickly responded to on the standard green cathode ray tube in capitalized small type face.

The model I saw demonstrated gave a great load of detail in response, and seemed limited in the sort of query it could accept. It seemed programmed to multiple-choice questions, which, step by step, narrowed down to an answer.

This demonstrated ability to model a region, seems to need further development for free inquiry and more dynamic graphic spatial display. The communication link from the model to the policy-maker is quite different than from the model to the researcher or programmer.

The significance of the Davis work seems to be in the extent to which a region can be modeled. Undoubtedly, it provides effective data access to middle management now, even in its type output. How might it be queried more effectively by policy-makers? Is graphic display of its output possible, especially on a spatial basis? Or is this modeling primarily for technical users who need, then, to "repackage it for policy-makers?

EPA - The Environmental Protection Agency

Office of Research and Monitoring
Environmental Studies Division
401 M Street, S.W.
Washington, D.C. 20460
(Dr. Peter House, Director - 202-557-7479)

The National Environmental Policy Act of 1969 led, in 1970, to the organization of EPA, the Clean Air Act, the Water Quality Improvement Act, and the Resource Recovery Act. EPA's concept of long-range comprehensive environmental planning in such resource terms has since been expanded to include the social, economic and physical factors involved in the term "Quality of Life." The President's Council on Environmental Quality provided this mandate when it said in 1970 "Effective strategy for national environmental quality requires a foundation of information on the current status of the environment, on changes and trends in its condition, on or what these changes mean ..."

Subsequently, EPA organized its complex computer based Strategic Environmental Assessment System (SEAS) "for the assessment of alternative procedures in terms of their long-range impact on the environment" with 10-20 year time horizons.

EPA has sponsored national and regional environmental research conferences, symposiums, and projects. Its ground-breaking importance as the lead federal agency in environmental resources management ties it closely to regional policy-making. Among its publications, see:

STRATEGIC ENVIRONMENTAL ASSESSMENT SYSTEM (SEAS), May 1973
Office of Research & Monitoring
Environmental Studies Division

ENVIRONMENT
National Conference on Managing the Environment
May 14-15, 1973 - Ramada Inn
Washington, D.C.

ANTHOLOGY OF SELECTED READINGS FOR THE SYMPOSIUM ON THE QUALITY OF LIFE CONCEPT - A Potential New Tool for Decision-Makers
Airlie House - August 1972

QUALITY OF LIFE CONCEPT - A Potential New Tool for Decision-Makers
c. June 1973

USGS/HUD - San Francisco Bay Region Environment & Resources Planning Study

U.S. Department of the Interior
U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025
(Robert Brown - 415-323-2145)

This study, jointly funded by HUD's Office for Research and Technology and the U.S. Geological Survey, began in January, 1970. It is conceived as a broadly based approach to relating physical environment factors, particularly geologic hazards, to regional and urban planning and development.

Original funding was based on estimates of a minimum effort in each of 30 earth-science program elements. Later, other elements of urban land use planning were added. The diversity of environmental considerations treated in the study, it was believed, should develop many principles applicable to other urban regions. It is considered highly experimental concerning the type of physical data collected, the way the data is synthesized, the formation in which the data is displayed, and the lines of communication that will help society utilize it. While there is a national interest here, it deals with the specifics of one region.

See publication: PROGRAM DESIGN, 1971 - San Francisco Bay Region Environment and Resources Planning Study, U.S. Geological Survey, Menlo Park, California 94025.

MRC-TV - Metropolitan Regional Council
Suite 2437
One World Trade Center
New York, N.Y. 10048
(Rodman Davis - 212-466-3850)

MRC-TV, inaugurated in June 1973, is an innovative telecommunications system serving local governments in the New York City metropolitan region. It employs a two-wave microwave television system:

1) from atop the 110-storey World Trade Center building in which MRC is headquartered to studios in each of the nine member communities,

2) between any two community studios, and

3) one-way video from each community studio to its local area, to which an audio return capability can be added.

The system is established by MRC and the nine member communities. NSF is financing a three-phase study of this system to determine its impact. The object is to bring public officials and other groups together via tele-conferencing. One black and white TV camera is installed at each studio location.

See publications: Intergovernmental Communities in the New York-New Jersey-Connecticut Metropolitan Region, 1972, and Communications and Government: A Regional Report, 1972, available from the RAND Corporation, Santa Monica, California 90406. See also MRC's bibliography on Communications, Telecommunications and Innovations.

HARVARD - Computer Graphics Technology

Program on Information Technologies and Public Policy
200 Aiken Computation Laboratory
Cambridge, Massachusetts 02138
(Anthony G. Oettinger, Director - 617-495-3946)

Laboratory for Computer Graphics and Spatial Analysis
Graduate School of Design
520 Gund Hall
48 Quincy Street
Cambridge, Massachusetts 02138
(Eric Teicholz, Associate Director - 617-495-2526)

Information Technology is an interdisciplinary program supported by the John & Mary R. Markle Foundation. It was launched in 1972 with two goals:

1) the development of a coherent understanding of information technologies and their policy implications, and

2) the illumination of public policy alternatives through this understanding.

The program criticizes prevailing views of information functions as fragmented by technology, institutional functions, application, policy issues and/or academic disciplines. It seeks an integrated view of information technology and makes the statement that computer and telecommunication technologies are now distinguishable only by their distinct constituent embodiments. A basic premise is that this inherent logic of information is increasingly unitary. (See its publication on STATUS AND PLANS, February 1971).

The Laboratory of Computer Graphics was established in the Spring of 1965 with a Ford Foundation grant. Under the direction of Howard T. Fisher, the Laboratory developed programs for high-speed, electronic digital computer mapping and new techniques for graphic display. It continues investigation into the uses of graphic analysis, computer graphics in particular. (The Laboratory is best known for its Synagraphic Mapping System, or SYMAP.) The Laboratory is also a service organization to the Harvard Graduate School of Design.

There are numerous laboratory publications available and it reports monthly through its newsletter CONTEXT.

HUD - Policy Planning and Research

Office of Policy Planning
Department of Housing and Urban Development
Washington, D.C. 20410
(Frederick A. McLaughlin, Jr., Director - 202-755-5965)

Community Environment and Utilities Technology Division
(Allan R. Siegel, Director - 202-755-5360)

HUD's role in housing, urban development, and local planning is well known and traces its roots back for decades, although the Department itself was authorized only in 1965. Its role in research and policy planning is not so well known.

HUD has led the ten agencies involved in its Urban Information Systems Inter-Agency Committee USAC since 1968. A major series of experiments in municipal information systems has been instituted through USAC. It has financed research application efforts such as Operation Breakthrough, Des Moine's Geo-Coding project, and the Regional Plan Association's Town Meeting TV series (see Section III), and the Metropolitan Regional Council-TV (this Section) are just three of the research efforts of significance to this regional graphics survey that are HUD-financed.

HUD is sponsoring a demonstration in rural Connecticut led by Dr. Peter Goldmark to show how telecommunications can provide services and amenities to make such areas competitive with cities. It is now also developing a community telecommunications demonstration concept to explore the potential impact of cable television or broadband communications on the urban environment. This concept is especially concerned with testing the delivery of social services via two-way communication and experimental demonstrations.

There is an interest here that has come to see in two-way television communication, means:

1) to relieve social and political alienation of individuals from government and community;

2) to provide immediate response to individual and neighborhood needs; and

3) to reduce costs for quality services to the individual consumer.

A particular concept at work here is a Community Information and Service Center which would provide a central point to which citizens could bring questions and problems relating to a wide variety of municipal services.

NATIONAL ACADEMY OF SCIENCES - Remote Sensing for Policy-Making

Committee on Remote Sensing Program
for Earth Resource Survey (CORSPERS)
National Academy of Sciences
2101 Constitution Avenue, N.W.
Washington, D.C. 20418
(Capt. Winfred Berg, Executive Secretary, CORSPERS - 202-961-1431)

Captain Berg is staffing the NAS Study on Remote Sensing for policy-making for which NASA and ERTA are providing demonstration data for special points in selected regions. Among the issues isolated is what digested data (information) the policy-maker should get in relation to familiar bases. What information is to be supplied? How is the base to be described?

An NAS panel representative of various applications of remote-sensed data is seeking to determine what information is needed. After that, how to sense from satellites can be resolved. At present ERTS' Satellite Sensor resolution is adequate for regional purposes such as crop control, drainage, blight, etc. An object 200' on a side can be sensed from a satellite 40 miles up. That information is digitized and radioed to earth stations where it is converted into a graphic, continuous tone ("photographic-like" image). DOD resolution photography from satellites, in which film is dropped by parachute, is by one report said to identify objects 50' on a side. Ultimate results from satellites down to one foot will be possible. Present 200' sensed from ERTS is inadequate for most urban planning purposes.

This NAS Study divides world information by remote sensor into three time categories on the basis of the frequency it is collected for use:

FREQUENCY	EXAMPLE OF USE
minutes - hours	hurricanes, weather, pollution, peak-hour traffic
days - months	agricultural crops, commuting traffic
year - years	basic earth science maps, urban development.

The NAS Study will be published by Spring 1974.

CONSENSOR - A Consensus Recording Device

Applied Futures, Inc.
22 Greenwich Place
Greenwich, Connecticut 06830
(W.W. Simmons - 202-661-9710)

The CONSENSOR is a device that assists in the decision-making process by facilitating the determination of consensus. It is designed for use by task groups and committees that meet in conference rooms to make decisions. The device consists of a terminal for each of the participants in the meeting. The terminals are connected by cables to the Master Control unit and Display Panel. Each terminal includes two switches, one to register response, one to register how strongly that response is felt. The Bar Graph Display shows the collective results.

The CONSENSOR is designed to clearly and quickly indicate the overall consensus of the group. It assures the participation of all the members of the group, while allowing the influence of each member's judgment on the overall consensus to have its effect. It also enables the individual participants to express their judgments anonymously, in that the Bar Graph Display only presents the consensus of the group.

A FINAL WORD

This preliminary study cannot be ended without one final apology to those doing work vital to the subject of graphic communications for regional policy-making, for what has been either inadequately described here or omitted altogether. Time!